STRATA™
STUDIO*Pro*

version 2.0
MACINTOSH

Reference Manual

First Printing
November 1996

S T R A T A

ACKNOWLEDGEMENTS
The JPEG support software is based in part on the work of the Independent JPEG Group.

INTRODUCTION

Welcome to Strata's StudioPro, the powerful 3-D graphics software that offers you endless modeling possibilities. StudioPro is a superior animation, rendering, and modeling application designed for the creative professional.

Before you begin using StudioPro, you should have a good working knowledge of the Macintosh computer and its operating system. If you need assistance, please see your *Macintosh User Guide* for more information on using the Macintosh computer.

StudioPro's interface is very intuitive and easy to use, for the advanced user as well as for the beginner. The controls and tools look and act as they do in other Macintosh applications.

The *StudioPro Reference Manual* provides detailed and in-depth information about using StudioPro. This manual is organized into three sections:

- **Section I** includes the menus and commands in the same order as they appear in the menu bar.

- **Section II** covers the palettes and windows and their functions.

- **Section III** contains reference material. Included in this section: specialized appendices, a glossary, and a comprehensive index.

The *StudioPro User Manual* provides you with easy-to-read instructions for using this program and teaches you how to effectively create your own models. It contains step-by-step instructions for using StudioPro.

When you have specific questions about commands or features in StudioPro that aren't covered in the *User Manual*, see the appropriate entry in the *Reference Manual*. For your convenience, the index includes entries for both the *User Manual* and the *Reference Manual*. The same index appears in each manual, making it easier to locate the information you need.

TABLE OF CONTENTS

SECTION 3: REFERENCE MATERIAL

1

MENUS

File Edit Selection Modeling Rendering Windows

StudioPro's Button Bar provides buttons for the commands you use most often. It always resides directly below the menu bar; you can't move the Button Bar to another location.

You can display or hide the Button Bar by selecting the **SHOW/HIDE BUTTON BAR** command from the Windows menu. Its show/hide status is remembered from session to session. If the Button Bar is hidden when you quit StudioPro, it remains hidden the next time you launch the application.

These buttons represent commands in the menus, but you may find the Button Bar more convenient to use. However, you can access most of these features through the standard menu commands as well, even when the Button Bar is hidden.

Buttons may be active or dimmed. If the action represented by the button cannot be used, the button is dimmed.

There are six additional buttons on the extreme right of the Button bar. They allow you to quickly show or hide the other palettes.

Resource Palette ——
Extension Tool Palette ——
Object Properties Palette ——
Environment Palette ——
Tool Palette ——
Project Window ——
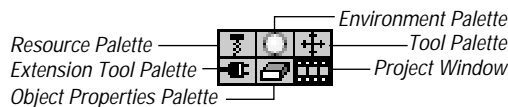
These buttons perform the same action as selecting Show/Hide palette commands found in the Windows menu.

NEW. This button opens a new model. It is the same as selecting the **NEW** command in the File menu. *See* **New** *on page 7* for more information on this command.

OPEN. Use this button to open an existing model. Clicking this button is the same as selecting the **OPEN** command in the File menu. *See* **Open** *on page 7* for more information.

SAVE. This button lets you save the active document. If the active document has never been saved, the *Save* dialog appears. This is the same as selecting the **SAVE** command from the File menu. For complete information on this command, *see* **Save** *on page 9*.

COPY. This button puts a copy of the selected object(s) on the clipboard. It is the same as selecting the **COPY** command from the Edit menu. For complete information on this command, *see* **Copy** *on page 18*.

CUT. This command removes the selected object from the model and places it on the clipboard. It is the same as selecting the **CUT** command from

the Edit menu. For more information on this command, *see* **Cut** *on page 17.*

PASTE. Use this command to paste the contents of the clipboard into the active model. Clicking this button is the same as selecting the **PASTE** command from the Edit menu. *See* **Paste** *on page 18.*

UNDO/REDO. Use the **UNDO/REDO** button to undo the last action. If you're not happy with the results, clicking the button again lets you redo what was undone. This is the same as selecting **UNDO/REDO** from the Edit menu. *See page 17* for more information.

RESHAPE. Use this button to reshape the selected object(s). If the selected object can't be reshaped in its present form, the button is dimmed. This is the same as selecting **RESHAPE** from the Modeling menu. *See* **Reshape** *on page 31.*

END RESHAPE/EDIT. Use this button to get out of Reshape, Edit Placement, or Edit Selected mode. Clicking this button is the same as selecting the **END RESHAPE/EDIT** command from the Modeling menu. *See* **End Reshape/Edit** *on page 42.*

CONVERT. This button allows you to convert the geometry of the selected object from one type to another. Clicking this button is the same as selecting **CONVERT** from the Modeling menu. *See* **Convert** *on page 42.*

GROUP. Use this button to combine the selected objects into one. *See* **Group** *on page 45.* This button is the same as choosing the **GROUP** command from the Modeling menu.

UNGROUP. This button splits grouped objects into separate objects again. It is the same as selecting the **UNGROUP** command from the Modeling menu. *See* **Ungroup** *on page 45.*

EDIT PLACEMENT. This button lets you edit the placement of textures on an object. This button also opens the Object Properties Palette for the selected object (if it's not already open) and brings the *Texture* tab to the front of the palette. *See* **Edit Placement** *on page 39* for more information.

Additional buttons may also appear on the Button Bar, depending on the extensions found in the *Strata StudioPro Extensions* folder at the time the application is launched.

ALIGN TO PATH. Use this button to align an object to its animation path. You control which direction the object is pointing as it travels along the animation path. *See* **Path** - **Align** *on page 46* for complete details.

METABALLS. This button allows you to transform separate elliptical shapes into a single, smoothly-blended entity. This is the same as selecting the **METABALLS** command from the

Modeling menu. *See* **Metaballs** *on page 47* for more information.

METABALLS -UNJOIN. This button lets you unjoin a Metaballs entity. This is the same as selecting the **UNJOIN** command from the Metaballs sub-menu in the Modeling menu. *See* **Unjoin** *on page 50.*

Three additional buttons are provided as an extra convenience when reshaping objects or when applying textures to objects.

Align Handles. Use this command to align previously hinged direction handles. This command is espe-

cially useful when a single set of direction handles resides on two different planes. *See page 35* for details.

Make First Point. To make a different vertex point the first point, select the desired vertex point, then click this button on the Button Bar. The selected point becomes the first point. See *page 37* for more information.

Fit Texture. While in texture place-ment mode, clicking this button centers the texture on the object with 100 percent coverage. *See page 40* for details.
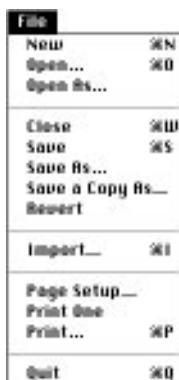
The File menu contains commands that relate to handling models and other documents. It provides a command for importing data into the current model. Also included are commands for setting up printing options to control the way StudioPro prints and sends images to the printer.

model aren't automatically available in another. You can, however, import or copy complete models, selected objects, shapes, and textures, or merge them into other models.

See also **Open As** *on page 8* and **Import** *on page 13.*

OPEN

COMMAND-O

OPENING MODELS

Use the **OPEN** command to open existing StudioPro models. If there's not enough memory available to open the model you select, an alert is displayed.

 You can also open an existing model by clicking the **OPEN** button on the Button Bar.

When you select the **OPEN** command, the *Open* dialog appears. This dialog reads other file formats into StudioPro, depending on the import/export extensions installed. You can open a model with any format supported by StudioPro, such as StudioPro version 1.75 or later, Illustrator™/EPS, DXF, 3DMF, and VRML.

NEW

COMMAND-N

Select **NEW** to open a new model. This command is always available because you can have more than one model open at a time. If there isn't enough memory available to open a new model, an alert is displayed.

 You can also open a new model by clicking the **NEW** button on the Button Bar.

The new model opens with the default window configuration, which is a single isometric view. You can change the default window configuration in the *Preferences* dialog box. *See* **Preferences** *on page 23* for more information on changing the default settings.

Each model is independent of any other models that are currently open. Any shapes or textures that you make in one

When you load a StudioPro model, it opens with the window and view configuration exactly as it was when you last saved the model. Other file formats open with the default window setting from the *Preferences* dialog box.

Note that the dialog shows only those files matching the formats supported by the extensions in StudioPro. If the format isn't supported, it doesn't appear in the directory.

If StudioPro encounters any geometry that is not supported when opening a Studio-Pro 1.75 model, a cube will be substituted. If any unsupported textures are encountered, that texture will be replaced by a default red texture.

OPENING IMAGES AND ANIMATIONS

You can use the **OPEN** command to access images as well as models. These images can be from any source, not just images that were rendered in StudioPro.

Files that use any of the recognized image formats appear in the dialog along with StudioPro models. Acceptable formats currently include PICT, TIFF, EPS, JPEG, Targa, and QuickTime; other formats may be included in the future. When you highlight a file name, its format appears in the dialog box below the directory. The file opens as either an image or a model, depending on the file type.

OPEN AS

To open files with non-standard formats, use the **OPEN AS** command. All files appear in the directory dialog. First select

the file, then select its format from the *File Format* pop-up menu.

This command is especially useful when you want to read non-standard file formats. For example, if a DXF document is transferred from an MS-DOS® system to the Macintosh, the file type of the document is sometimes designated incorrectly. Even though the **OPEN** command will not recognize the file accurately, the **OPEN AS** command will allow you to read the file as a DXF document.

You need to know the file type of the selected file; StudioPro makes no attempt to guess the file type. If the file format you specify isn't correct (if the actual data doesn't conform to the expected format), an alert is displayed.

CLOSE

COMMAND-W

Use the **CLOSE** command to close the active (front-most) window. You can close a window in several different ways:

- **Click on the close box**.

- **Option-click on the close box of a window**. Hold down the Option key while

clicking on a window's close box. This will close all windows for the model.

- **Choose CLOSE from the File menu**. If the modeling window is the active window, all windows currently open for that model disappear from the screen and the model closes. Or, you can use the *Command-W* keystroke instead.

CLOSING MODEL WINDOWS

When you close a model that has never been saved, you'll be asked if you want to save before closing. If you click *Yes,* the *Save* dialog appears, allowing you to specify a name and location for the file.

If you've made any changes to your model since it was last saved, you'll be asked if you want to save again before closing. If you click *Yes,* the model is saved with its current name and in the same file location as when you last saved it.

CLOSING RENDERING WINDOWS

When you close a completed rendering that you haven't saved yet, or one you've made changes to since you last saved (such as a rendering that you previously suspended), you'll be asked if you want to save before closing. If the image required less than 30 seconds to render, however, StudioPro assumes that you rendered the image for preview purposes only, and you won't be asked if you want to save before closing.

If you close an unfinished rendering that has been in progress for longer than 30 seconds, StudioPro asks if you want to

suspend the rendering. If you want to suspend the rendering, click the *Yes* button. The *Suspend Rendering* dialog is displayed.

Once a rendering is complete, the rendering window has no ties to the model. However, if you close a model with a rendering still in progress, you'll terminate the rendering as well.

Modifier keys that apply to the CLOSE command:

- **Option key** closes ALL modeling windows for the active model. This closes the entire model. Without the Option key, the **CLOSE** command closes only the active window, leaving all other windows alone.

SAVE

COMMAND-S

The **SAVE** command is used to save models and images. A separate **SAVE** command is provided in the Plus menu of the Resource Palette for saving resources (shapes, textures, effects, etc.) so they can be accessed later for use in other models.

SAVING DOCUMENTS

Use the **SAVE** command to save changes made to either a model or a rendered image. The **SAVE** command is available whenever you make any changes. The command is dimmed if you haven't made any changes since the last time you saved.

 You can also save the active document by clicking the **SAVE** button on the Button Bar. The active document can be either a model or a rendered image.

If the active document has never been saved, the *Save* dialog box appears. This dialog lets you name the document, and select the location to which it is saved.

For previously-saved models, this command replaces the old version with the current version.

SAVING UNFINISHED RENDERINGS

You can save an unfinished rendering before it completes rendering. Select **SAVE** from the File menu at any time during the rendering process. The *Save As* dialog automatically provides a default name based on the name of the model where the snapshot was taken.

The file format for the image defaults to PICT. However, you can choose other formats from the pop-up menu in the dialog. The formats available depend on which import/export extensions are installed in the *Strata™ StudioPro Extensions* folder. The options that appear in the secondary dialog depend on the format selected from the *File Format* pop-up menu. For more information, *see* **Save As***, below.*

SAVE AS

Use the **SAVE AS** command to save the active document using a different name and location. You can also choose which file format to use. You can use this command to save models, animations, or images.

Shapes, textures, and effects are saved by selecting the **SAVE** command from the Plus menu of the Resource Palette.

SAVING MODELS

You can save models with any of the file formats listed in the *File Format* pop-up list. Formats supported include StudioPro 2.0, DXF, 3DMF, and VRML.

Regardless of any other formats you wish to use, you should always initially save your model as a StudioPro 2.0 file. This will allow you to go back to the original model and edit it, if necessary.

When the dialog opens, the *Save this model as* field contains the current name of the model. If you want to save the model

with a different name, enter the new name in this field.

If you haven't saved the model yet, a default name is provided (Untitled-1, Untitled-2, etc.) which you can change as desired.

When you save a document with a new name, the new name, disk volume and folder location will be used for all future saves to the document. You can change the name, file location, and file format of the model at any time by using the **SAVE AS** command.

Depending on the format you select, a dialog may appear that allows you to specify the settings for exporting this file.

Some export formats may require that specific data about the model be included in the file.

• **Export model view data**. Check this box to save and export the active modeling view. Use the view management tools to get the exact angle you want before exporting the file.

• **Export light source markers**. Check this option if you want to see and manipulate the light object in another application. This allows you to see where the original light source was, but will not change the lighting effect.

• **Export light source data**. Check this option to export the effect of the light source, but not the light source marker itself.

• **Binary**. Check this option for normal use. Both *Text* and *Binary* files contain the same information, but each type stores it differently.

• **Text**. This option saves the model as text which can be read and edited in text applications. It includes the model's geometry, textures, and light sources. The *Text* option will create a much larger file than the *Binary* option.

• **Complexity slider**. The export dialogs allow you to specify the complexity of the model. The position of this slider determines the complexity, or amount of detail, with which each object in the model is exported.

• **Absolute check box**. If the *Absolute* check box is *checked* AND the object's *Absolute* check box on the Object Properties Palette is checked, the object's

Complexity Slider setting overrides the setting of the slider in this dialog.

When the *Absolute* check box is *unchecked,* the setting of the *Complexity* slider in this dialog will be used for all objects.

SAVING IMAGES FROM MODELING WINDOWS

You can save images from the modeling windows or camera windows. Images are simply 2-D representations of the model; they don't contain any model information. Once you've saved an image, it becomes completely independent of the model. To save images, use the **SAVE AS** command and select a format from the *Format* pop-up list.

SAVING STILL IMAGES

You can save the image in a rendering window at any time during the rendering process. The image at the point when you save the rendering will become a separate file. You can rename later saves of the image, as it continues to render, or you can replace the previously-saved image with the same name.

By default, StudioPro saves in *PICT* format, but you can choose any of the other formats that StudioPro supports. However, images rendered with the Quick-Time Panorama camera must be saved in PICT format.

Select a file format from the pop-up menu. When you click the *Save* button, the *Compression Settings* dialog appears which allows you to choose the color depth and a compression method.

The compression and color depth options available depend on the file format you select.

If you set the color depth at 256 colors, you can elect to save the image with an optimal color palette. An optimized color palette includes the colors contained in the image you're saving. When you open the image later in an application that uses optimized palettes, it displays on the monitor with less dithering.

You must save the image with *Millions of Colors+* if you want to include alpha data in the file.

If you select *QuickTime* or *PICT* file formats, the maximum image size is 16K by

16 K pixels. The maximum size for either *Targa* or *JPEG* is 32K by 32K pixels.

SAVING ANIMATIONS

Each frame of an animation is saved as it is rendered. Once the entire animation completes rendering, however, the **SAVE A COPY AS** command (below) can be used to save the file with a different name or in a different format. For information on saving animations and the formats available, *see* **Rendering Animations** *on page 64.*

SAVE A COPY AS

MODELS

The **SAVE A COPY AS** command allows you to save a copy of the current model with a different name (and in a different location, if you choose) without changing the current name of your model. In this way, the current name and location will be retained for future saves, not the one used with the copy.
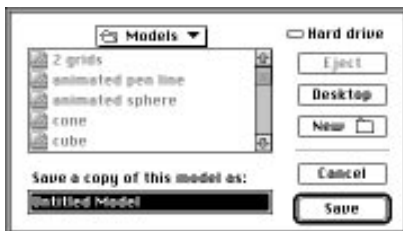
IMAGES AND ANIMATIONS

When saving a copy of an image or an animation, the **SAVE A COPY AS** command also allows you to select a format to use for the save operation.

REVERT

Use the **REVERT** command to discard any changes you've made to your model since you last saved it. If you've already saved your document and then make changes to it, this command is available.

When you select the **REVERT** command, an alert warns you that your changes will be permanently discarded.

IMPORT

COMMAND-I

The **IMPORT** command allows you to merge StudioPro models with models or images created in other formats into the current model.

When you select a file to import, the *File Format* field shows the file format used when it was saved.

There are several import options available for DXF files that let you specify how to transport the imported file into StudioPro data.
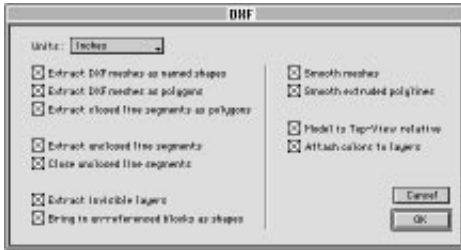
The options set in these dialogs are retained from session to session, so the next time you import a DXF file, the *DXF Import Options* dialog appears with the same settings you chose the last time it was used.

In addition to the import/export extensions that ship with StudioPro, other formats may also be supported with extension import filters provided by Strata Inc. or by third-party developers. If the file appears in the *Import* directory dialog and its file format is correctly identified in the *File Format* field at the bottom of the dialog, the chances are excellent that you can successfully import the file.

Any data you import into your model is loaded into a Shape workspace, and its preview appears on the Shapes tab of the Resource Palette. It can then be inserted into the model in the same manner as any other shape.

Objects are imported at the same scale at which they were created. This scale will be converted to the units that you are currently using in StudioPro.

Because all imported data is treated as a shape, you should handle the editing and texture applications as you would any other shape that you have created directly in the program.

If StudioPro encounters any geometry that is not supported while importing a 1.75 model, a cube will be substituted. If any unsupported textures are encountered, that texture will be replaced by a default red texture.

EXTRACTING 2-D POLYGONS FROM PIXEL IMAGES

In addition, the **IMPORT** command can also create 2-D data from paint and drawing applications. These files must be saved in bitmapped (one-bit) form to work. Black is interpreted as surface and white is empty space. If saved in color or grayscale form, the image is converted to a 3-D object instead.

There are two types of EPS files: those from PostScript drawing programs, and those from paint programs that save pixel-type images encapsulated in a PostScript shell. Both may have a PICT format preview image stored in their resource fork.

The larger the image, the more accurate the object's geometry will be. This is easy to accomplish in PICT format, but EPS files have a fixed preview image size, no matter how large the PostScript drawing inside. In this case, the options are to convert the PostScript information to Illustrator™ format and use the better importing method available to that file format, or re-save it in PICT format to gain access to the larger image.

EXTRACTING 3-D OBJECTS FROM GRAYSCALE IMAGES

The **IMPORT** command also recognizes grayscale images. Instead of converting the image to 2-D polygons, its gray values are interpreted as elevation data from which a 3-D object can be created. Once it's inserted into the model, you can handle it just like any other shape.

PAGE SETUP

The **PAGE SETUP** command allows you to specify printing information, such as page size, image orientation and image size. The active window may contain either a model view or an image.

Choosing **PAGE SETUP** displays the *Page Setup* dialog box. The options provided in the dialog depend on the printer driver installed. See the documentation supplied with your printer for details.

PRINT

COMMAND-P

The **PRINT** command displays a dialog that allows you to specify various printing options for your document. These options include the range of pages to be printed, tiling, color depth, etc.

PRINT is available whenever a document is open. Choosing the **PRINT** command displays the *Print* dialog box. The options provided in the dialog depend on the printer driver installed.

PRINT ONE

The **PRINT ONE** command allows you to print one copy of the active document using the current print settings. No dialog is displayed with this command.

QUIT

COMMAND-Q

Choose **QUIT** to exit StudioPro. Before quitting, StudioPro asks if you want to save changes to any open, un-saved documents or documents that have been changed since they were last saved.

Any changes you make to the *Preferences* dialog box during the session are updated to the *StudioPro Preferences* file at this time.

The Edit menu provides you with commands for editing the objects in your model and for controlling grids. Commands are also included to change the default specifications of StudioPro, as well as allowing you to customize the application to meet your specific needs.

UNDO/REDO

COMMAND-Z

Select **UNDO** to reverse the last action performed. You can undo most operations. The name of the command specifies what can be undone. For example, **UNDO OBJECT ROTATION** appears after you use the Object Rotate tool.

Once you undo the action, the menu entry changes to **REDO**. This means that you can repeat the previous action by using this command. You can alternate between **UNDO** and **REDO** as often as needed.

This command is also available by clicking the **UNDO/REDO** button on the Button bar.

If the operation can't be undone, the command name changes to **CAN'T UNDO**. How-ever, even when you can't use this command to undo an action, there's often another command or tool that you can use to reverse the first action.

CUT

COMMAND-X

Use the **CUT** command to remove the selected items from the document and store them on the clipboard. Each time you use the **CUT** command, the most recently cut items replace the previous contents of the Clipboard.

You can also access this command by clicking the **CUT** button on the Button bar. This command is available only if something is selected. If nothing is selected, both the command in the menu and the button on the Button Bar are dimmed.

Items that you can **CUT** are objects in a model (including light sources and cameras), text in a dialog field, surface maps in a texture, or anything else that you can select.

Modifier keys that apply to the CUT command:

• **Option key** removes the selected object(s) from a StudioPro model and retains the coordinates for those objects. Without the Option key, the position of

the object(s) in 3-D space is not retained when pasted into another model.

COPY

COMMAND-C

Select the **COPY** command to place a copy of the selected items on the clipboard. **COPY** does not remove anything from the document, but it does replace the previous contents of the clipboard with the copied items.

You can also choose this command by clicking the **COPY** button on the Button Bar. This command is available whenever an item is selected.

You can **COPY** anything that you can select. This includes the objects in a model, as well as text in a dialog, surface maps in a texture, etc.

Modifier keys that apply to the COPY command:

• **Option key** copies selected objects from a StudioPro model with the coordinates for those objects so they may be pasted into another model with absolute coordinates (see **PASTE** command). Without the Option key, the objects' positions in 3-D space are not retained and will paste into another model relative to the active view.

PASTE

COMMAND-V

The **PASTE** command places the contents of the clipboard in the active document, keeping all of the data intact.

You can also access this command by selecting the **PASTE** button on the Button bar. This command is available as long as the clipboard contains an appropriate item.

Items that you **PASTE** must be in the same context as the place from which you copied them. For example, you can't paste a 3-D object into a text field in a dialog, or text from a dialog into the modeling window.

Modifier keys that apply to the PASTE command:

• **Option key** pastes the contents of the clipboard into the same coordinates from which it was copied. This behavior works ONLY if the item on the clipboard is a StudioPro object that was cut or copied with the Option key held down as well. Without the Option key, the object is pasted at the location of the view set center.

DELETE

DELETE KEY

When you select the **DELETE** command, any selected items are removed from your model. They are not saved to the clipboard. Selecting the **DELETE** command is the same as using the Delete key on the keyboard.

DUPLICATE

COMMAND-D

Use the **DUPLICATE** command to create a copy of the selected object, slightly offset

(0.25 inches or equivalent unit) from the original. The copy becomes the selected object.

You can control the amount of offset used by this command. To change the default offset, first select an object and choose **DUPLICATE** from the Edit menu. Then drag the newly duplicated object the desired distance from the original. The distance you drag the duplicate from the original becomes the new offset each time you use the **DUPLICATE** command.

If more than one model is open, each model can have its own offset value which remains in effect until the model is closed. However, each time you open a model, the original default offset of 0.25 inches (or equivalent unit) is restored.

All of the properties of the original object are copied in the duplicate, including geometry, textures, animation path, shapes hierarchy, etc.

REPLICATE

The **REPLICATE** command creates multiple copies of a selected object or group of objects.

The dialog box lets you input numeric values for each replication setting. The values are in the same units as defined in the *Preferences* settings.
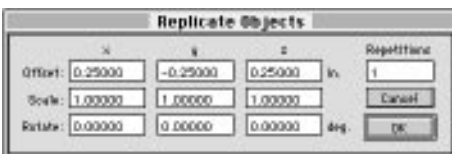
The fields perform the following functions:

- **Offset**. These fields allow you to specify the offset distances along one or more of the three axes for each successive copy. If the units are set to inches, the default value of the offset is 0.25 inches on all three axes.

- **Scale**. These fields let you specify the size of each copy relative to the original. A value of two will double the size of the object(s) with each repetition. A value of one, which is the default value, will make all copies the same size as the original. A value of 0.5 will result in half the size with each repetition.

- **Rotate**. These fields allow you to specify the amount (in degrees) on all three axes by which each repetition should be rotated from its predecessor. The default value for rotation is zero degrees on all axes.

- **Repetitions**. This field specifies how many times the **REPLICATE** command should copy the object(s). The default setting for this field is one.

Any settings you enter in the *Replicate* dialog are retained until you change them or until you close the model. The settings in the *Replicate* dialog apply to the current model only. If more than one model is open, the *Replicate* settings in each model can be different. However, the original default settings are restored each time you open a model.

SET UNITS

Choose **SET UNITS** to select the default units of measurement. **SET UNITS** is available whenever a model is open. If no model is open, the command name changes to **SET DEFAULT UNITS**, and any changes you make to the dialog become the new default settings.

This command displays a dialog box which allows you to choose from pre-defined units of measure. Select *Arbitrary* to specify your own units of measure. You can also specify the abbreviation that's used for the units you define. In the dialog above, *Ten Pixels* is specified as the name for the arbitrary units, and each unit is equivalent to ten pixels.

The *Snap subdivisions* field allows you to specify the number of subdivisions within each unit. This value is then used when the *Snap to Grid* option is enabled. In the dialog above, each unit of ten pixels is divided into two subdivisions. Therefore, objects will snap at five pixel increments. You can enter any integer value greater than zero in this field.

The *Nudge subdivisions* field allows you to indicate the number of subdivisions within each unit to use for nudging objects in your model. In the above example, each unit of ten pixels is divided into ten equal subdivisions. Therefore, each nudge is equivalent to one pixel. Enter any integer value greater than zero in this field.

Nudge works with any of the object manipulation tools: Move, Rotate, or Scale. All nudge operations are relative to the active grid. The arrow keys nudge the selected object along the grid in the direction indicated by the arrow. The Command + Up Arrow and Command + Down Arrow keys nudge the selection perpendicular to the active grid.

Keystroke	Direction moved (relative to the active grid)
Up-Arrow	Positive Y direction
Down-Arrow	Negative Y direction
Right-Arrow	Positive X direction
Left-Arrow	Negative X direction
Command-Up-Arrow	Positive Z direction
Command-Down-Arrow	Negative Z direction

You can also specify how often grid lines are displayed. You can enter any number greater than zero in this *Grid Lines* field. In the above example, grid lines appear every 30 pixels.

NOTE *Models do not save the units in which they were constructed. If you change the default units, and then open a model that uses another scale, the current units and scale are adopted by the opened model.*

SNAP TO GRID

Select this command when you want all objects to snap to the active grid when moving them. Snapping occurs in the increments specified in the *Set Units* dia-

log. This command also affects the placement of any objects you insert in your model.

SNAP TO GRID applies to any active grid in your model. When this command is enabled, a checkmark appears next to the command name in the menu. Select the command again to disable this option.

HIDE GRIDS

Select the **HIDE GRIDS** command to hide all grids in your model. When you select this command, the view grid becomes the active grid, even though the view grid is also hidden. All modeling is done relative to the active view while **HIDE GRIDS** is enabled.

A check appears next to the command name in the menu when this command is enabled. Select the command again to disable it.

ACTIVE GRID

Select the **ACTIVE GRID** command to specify which grid is active. This command is available only if the **HIDE GRIDS** command is disabled.

When you select the command, a sub-menu appears. Each grid in the model appears in this list. Only one grid can be active at a time, and the active grid is

always visible unless **HIDE GRIDS** is enabled.
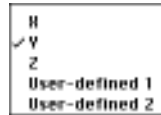
If you select a grid that is currently hidden (with the **VISIBLE GRID** command), that grid becomes visible only while active. Then, when you choose a different grid from the sub-menu, the current grid returns to its hidden status.

In addition to this command, there are other ways of selecting the active grid. You can select one of the system grids with the X, Y, or Z hotkeys. You can cycle forward or backward through all of the system or user-defined grids in your model with the plus (+) key or the minus (-) key.

VISIBLE GRIDS

When you select the **VISIBLE GRIDS** command, a sub-menu appears that allows you to specify which grids to display in the modeling window.
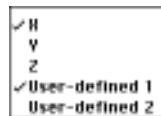
To view individual grids, select them by name from this sub-menu. Any number of grids may be designated as visible at a time, or none at all, but the active grid is always visible unless **HIDE GRIDS** is enabled.

If **HIDE GRIDS** is enabled, the **VISIBLE GRIDS** command is dimmed and unavailable.

Grids that are visible in the modeling window appear with a checkmark in front of their names. To turn off a grid that's currently visible (checked), select the grid again to de-select it. This will remove the check from in front of its name.

SHOW/HIDE CLIPBOARD

The **SHOW CLIPBOARD** command displays the current contents of the clipboard. When the clipboard is open, the menu command changes to **HIDE CLIPBOARD**. The **HIDE CLIPBOARD** command is the same as clicking the clipboard window's close box.

You can't edit the contents of the clipboard. Each time you use the **CUT** or **COPY** commands, the contents of the clipboard are replaced. Also note that the clipboard is erased when the computer is restarted or shut down.

CUSTOMIZE MENUS

The **CUSTOMIZE MENUS** command lets you define your own command keystrokes to use in the menus. The command name itself is not editable.

StudioPro ships with a default set of keystrokes for the commands. You may use these, or change them as you desire. You may also add keystrokes to any command that does not already have one defined.

After selecting the **CUSTOMIZE MENUS** command, a dialog opens instructing you to choose the command for which you want to add or change the keystroke shortcut.

When you select a menu command to change, the command won't perform its normal function. Instead, a second dialog appears.
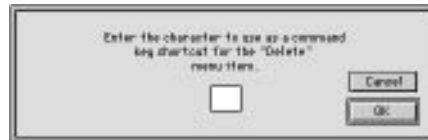
This dialog asks for a keystroke to be used (along with the Command key) as the shortcut for the command. When you click *OK*, the first dialog appears again. This dialog remains open so that you can change as many command keystrokes as you want at one time. When you've finished making changes, click the *Done* button or push the Return key.

NOTE *Normally, command keystrokes use a two-key combination involving just the Command key and another character. On occasion, you may wish to use a three-key combination. While you may enter only one character in the dialog, you can use the Option key while entering the single keystroke. Then, when you use the keystroke to select the command, you must hold down both the Command and Option keys while typing the character. Only two characters are displayed in the menu (the Command key and character combination), but the character displayed is the one*

obtained through the Option key, if used, to remind you of the special keystroke variation.

PREFERENCES

You can change the default settings of the application so that StudioPro will start up each time with the settings you specify.

Choose the **PREFERENCES** command from the Edit menu to display the *Preferences* dialog. The dialog contains three tabs: *General*, *Spooling*, and *Windows*.

General

- **Enable feedback on new renderings**. Check this box if you want to watch the image take shape while it is rendering. This will cause the rendering process to take a little longer, however.

  If this box is not checked, images still render internally, but no information is sent to the screen so the rendering proceeds faster.

  With the feedback turned off, you can still display the progress of the rendering.

   Refresh button

Click once on the button with the pencil icon to update the Rendering window. The image redraws, and the rendering continues without further updating unless the pencil icon is clicked again.

- **Keep a rendering log in the system folder**. This field turns on a rendering log that is stored in the same location in the System Folder as the Preferences file.

```
☐---- "(Untitled-1) Snapshot-1"
Program version: 2.0 ☐Rendering begins: Wed, Aug 28, 1996 11:00:38 AM
Rendering method: Raytracing
Rendering size:  (457, 332)
Rendering frames: 0 to 0
Frame rate:    15
Camera settings:
  Focal length: 31.601364
  Scale:    0.100000
  View center: (228, 166)
  From point:  (24.345450, 62.218895, 489.514191)
  To vector:  (-0.139173, 0.000000, -0.990268)
  Up vector:  (-0.306010, 0.951057, 0.043007)
Rendering done:  Wed, Aug 28, 1996 11:02:32 AM
Elapsed time:  0:01:54
```

The rendering log contains a variety of information, including start time, finish time, type of renderer, and time to render.

The rendering log is a simple text file that records the start and end times for your rendering projects. It also documents the speed of the rendering (in pixels per second), as well as the conditions under which a rendering in progress has been terminated, if applicable.

- **Enable feedback on suspended renderings**. This field controls whether screen feedback is *On* for suspended renderings when they are restarted. This is the same as the previous description of screen feedback for new renderings.

- **Use View Grids Always**. When this box is checked, new models open with the *View Grids* active. With *View Grids*

enabled, all modeling occurs relative to the active view. To disable *View Grids*, click the *View Grid button* on the modeling window. *See* View Grids *on page 236* for more information.

If this box is unchecked, all models open with the default grid specified on the *Windows* tab.

• **Camera Up-vector correction**. When this box is checked, the default camera tool setting is to constrain the camera from rolling as it moves through your model. The camera always remains in a vertical orientation.

Spooling

Image spooling is the process of setting up a buffer or cache on the hard-disk drive. A cache is a temporary memory or hard-disk storage allocation used by StudioPro. Using caches may cause slower rendering speeds. Several rendering processes require caches to make more room available when handling images that cannot fit completely in RAM.

• **Enable spooling for renderings**. The actual rendering process occurs in memory, but through the use of image caching, renderings too large for the available memory can still be created. Disabling this option forces StudioPro

to keep the entire image in memory, which may render faster, but can severely limit the size of rendered images.

• **Enable image map optimization**. This check box allows a blanket optimization to occur for any new textures you create in your existing model, or when you open an existing model. Once the maps in existing models have been optimized, they remain in that form when saved, so you may wish to save map-optimized models with a different name.

This optimization improves rendering speed by storing ALL color maps in the model as 32-bit images and all gray-scale maps as 8-bit images. This allows rendering algorithms to run more efficiently. The actual speed improvement depends on several factors, but it will be significant.

Note that when the check box for map optimization is enabled, the color depth pull-down menu in the *Image Map* dialog is inoperative for individual maps you load into a texture, even though it still appears active.

Map optimization takes more memory, so if memory is a problem, you should not use this feature.

• **Cache...** These buttons allow you to designate two separate volumes on which to create spooling files. When no more space is available on the first volume, spooling continues to the other cache file. You can put the spooling file

on any mounted volume to which you have write access.

Locate spooling file folder

When you have designated a location, click the *Select Current folder* button at the top of the dialog.

A check box is also provided for enabling or disabling spooling to either volume. We recommend that at least one cache remain enabled at all times.

Windows

- **Put new document on best screen**. If you have more than one monitor, checking this box will cause the new window to open on the best color monitor. If there is no difference in color depth between the monitors, the window will open on the monitor where the Menu bar appears.

If this option is disabled, the new window also opens on the monitor where the Menu bar appears.

- **Initial object display**. You can specify the display method used when a new model window opens. There are several choices in the *Initial object display* field's pop-up menu: *Point Cloud, Wireframe, Flat,* and *Shaded.*

Modeling in the *Shaded* mode lets you take advantage of all of StudioPro's modeling features, but takes longer to redraw. To speed up redraws but retain some color and lighting information in the modeling window, select the *Flat* display method. For the fastest redraws, use the *Point Cloud* or *Wireframe* option.

You can change the display method later from the *Display Method* pop-up menu located at the top of the modeling window.

- **Initial Perspective.** The default perspective used when opening new modeling windows is set by the *Initial Perspective* field. The pop-up menu allows you to choose from three settings: *Orthographic, Normal,* and *Wide Angle.*

These settings correspond to the three-position perspective control found at the top of each modeling window. The three choices indicate how the views in the new window present objects in the model. They indicate how much perspective is in the display.

Orthographic displays present the parallel lines of objects in the model as parallel lines in the views. There is no vanishing point, no convergence of

lines with distance. *Orthographic* displays preserve the absolute dimensions of objects, so they can be sized accurately relative to each other.

The *Normal* and *Wide Angle* settings provide perspective and produce more realistic views, but do not maintain actual or relative dimensions. Distant objects are displayed smaller than those closer to the viewing plane, even when they are the same size.

- **Initial grid**. You can specify the default grid that appears whenever a new model is opened.

- **New document window**. You can specify the default setting for new document windows.

- **Interactivity limit**. This pop-up menu allows you to set the speed at which a selected object reverts to a simple outline (bounding box) while in motion.

- **Background color**. You may specify the background color used in the modeling window.

NOTE *If multiple monitors are installed on your computer, StudioPro will ALWAYS open the color picker on the monitor with the most color depth available.*

If you change the background color, that change applies immediately to the current model when you click the *OK* button, as well as for all future models. The background color is not saved with the model. Don't confuse the background color with the background applied to the model on the Environment Palette. This is the background color of the modeling window only.

SAVING PREFERENCE SETTINGS

Changes in the *Preferences* dialog box take effect immediately in the current model, and StudioPro updates its Preference file stored in the System folder.
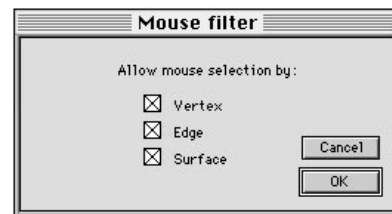
The Selection menu commands are provided to make it easier to handle complex models. These commands allow you to specify how objects are selected.

button while the cursor is in the active view, but away from any objects.

MOUSE FILTER

Several selection commands are available to determine how and which objects to select. Sometimes it becomes very difficult to select objects, either because they are inside another object or behind an object in the active view.

The **MOUSE FILTER** command displays a dialog with options for selecting objects. These check boxes allow you to select surfaces only, vertices only, or edges only; or you may use any combination of the three. The mouse filter settings are retained between sessions or until you change them.

SELECT ALL

COMMAND-A

Use the **SELECT ALL** command to select all of the visible objects, light sources, and cameras in your model. **SELECT ALL** is available when a model is active and there is at least one object in the model.

Selection handles appear around selected objects. Any objects or shapes that are hidden are not selected with this command.

You can add or remove objects from the group of selected objects by holding down the Shift key while clicking on the object. In this manner, you can de-select a selected object without affecting any of the other objects.

Each time you click the mouse, StudioPro checks to see if this point matches any of the mouse filters you've selected. If the point matches, the object is selected. If no match is made, no selection is made.

SELECT NONE

COMMAND-1

The **SELECT NONE** command de-selects all currently selected objects. Using this command is the same as clicking the mouse

If you turn off ALL three selection filters, clicking on an object will never select it, since no condition exists to match the settings. However, you can still select objects

by dragging a selection marquee around them.

HIDE SELECTED

COMMAND-3

The **HIDE SELECTED** command hides the selected object(s). Hidden objects don't appear in the modeling window, nor do they render while hidden.

This command can be used when you're trying to select objects behind, or inside, other objects. For more information on selecting objects that are hidden behind or within other objects, *see* Selecting Objects *on page 82.*

This command may also be useful when you want to temporarily hide objects. Hiding complex objects may decrease the time required for rendering and re-drawing.

When you select the **HIDE SELECTED** command, the "hide" icon appears next to the name of the selected object(s) or group in the Project Window.

SHOW HIDDEN

COMMAND-4

The **SHOW HIDDEN** command shows all objects that where previously hidden in the active model.

When you select the **SHOW HIDDEN** command, the "show" icon appears next to the names of all previously hidden objects in the Project Window.

This command has no effect on shapes hidden with the **HIDE SHAPE** command in the plus menu on the Resource Palette.

MAKE SHY

COMMAND-5

The **MAKE SHY** command renders the selected object(s), but *shy* objects do not appear in the modeling window.

This feature is useful when you've finished working on a particular object in the model. You can remove the object from the modeling window so that it doesn't obscure other objects or interfere with the modeling process.

If the object you've selected is an instance of a shape, then only the instance is hidden. Other instances are still visible. You can still access the shape for editing. The **HIDE SHAPE** command in the Plus menu of the Resource Palette allows you to hide all instances of a shape.

When you select the **MAKE SHY** command, the "shy" icon appears next to the name of the selected object in the Project Window.

MAKE SHY NORMAL

COMMAND-6

Use this command to make objects that were previously designated as "shy" to appear in the modeling window, as well as in renderings.

When you select the **MAKE SHY NORMAL** command, the "normal"

icon appears next to the names of all objects that were previously shy in the Project Window.

MAKE CONSTRUCTION

COMMAND-7

Use the **MAKE CONSTRUCTION** command when you want the selected object(s) to display in the modeling window only. Construction objects are used as an aid during the modeling process. They do not appear in renderings.

When you select the **MAKE CON-STRUCTION** command, the "construc-

tion" icon appears next to the name of the selected object(s) in the Project Window.

MAKE CONSTRUCTION NORMAL

COMMAND-8

Use this command if you want all of the previously-designated construction objects to appear in rendered images.

When you select this command, the "normal" icon appears next to the names of all objects that were previously specified as construction objects.

INTRODUCTION

The Modeling menu contains commands for working with objects. It allows you to group and ungroup objects and accurately position them in your model. Modeling extensions that are present in the *Strata Studio-Pro™ Extensions* folder at the time the application is launched appear at the bottom of the menu. Therefore, the contents of this menu may change, depending on the contents of the *Extensions* folder.

RESHAPE

COMMAND-L

Select **RESHAPE** to edit objects after they've been created. This command allows you to push and pull vertices on any axis to mold the selected object into any configuration.

You can also access this command by clicking the **RESHAPE** button on the Button Bar.

Different object types are reshaped in different ways. The Tool Palette changes to provide the tools necessary for the specific object type being edited.

There are two different types of Reshape:

- **3-D Reshape** allows you to reshape three-dimensional Bézier or polygonal objects only. If you want to reshape entities created with the modeling tools, such as Lathe or Extrude, you will need to convert them to another object type first.

- **2-D Reshape** allows you to reshape two-dimensional objects. This includes the 2-D construction elements used for creating objects with the various modeling tools, such as Lathe, Extrude, Path Extrude, etc.

Objects may be reshaped directly in the modeling window. Select the object you want to reshape, then select the **RESHAPE** command from the Modeling menu. If the object you select cannot be re-shaped, the command is dimmed. Some object types may need to be converted before they can be reshaped, depending on how you want to reshape the object.

To reshape an object in its own window instead of in the modeling window, double-click on the object. That object opens in its own window. Now if you select the **RESHAPE** command or click the **RESHAPE** button on the Button Bar, you can edit the object in its own window.

Any changes you make to an object while in reshape mode take effect immediately. The **UNDO** command is available if you're unhappy with the results, but it must be used immediately after the action.

When you're finished reshaping the selected object(s), select the **END RESHAPE/EDIT** command.

3-D RESHAPE

If the selected object is a Bézier or polygonal object, when you select the **RESHAPE** command the Tool Palette changes to provide the tools required for reshaping them.
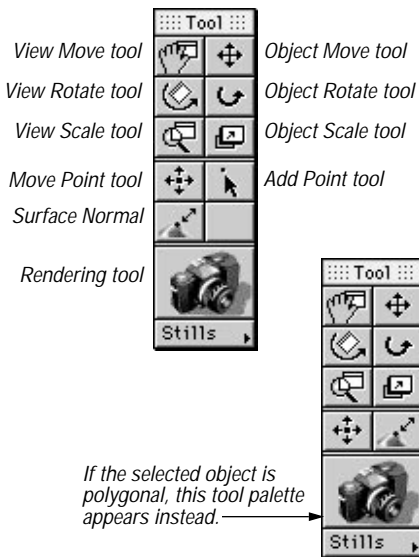
View Move tool — Object Move tool
View Rotate tool — Object Rotate tool
View Scale tool — Object Scale tool
Move Point tool — Add Point tool
Surface Normal
Rendering tool

If the selected object is polygonal, this tool palette appears instead.

The top six tools provide the same function in Reshape mode as they do during modeling. The Object Move, Rotate, and Scale tools can be used on any of the objects in the modeling window. They apply to objects only, not to selected vertex points.

Additional tools are provided to assist you in reshaping objects by manipulating the

vertices. Each tool performs a specific function.

Move Point tool. Use this tool to move one or more vertex points along a plane parallel to the active grid. If you hold down the Command + Shift keys while using this tool, you can move points perpendicular to the active grid.

Surface Normal tool. Use this tool to move the selected vertex point(s) in the direction the surface normal faces. (The surface normal is the direction the surface is facing in 3-D space, or the direction perpendicular to the surface.)

Add Point tool. Use this tool to add another vertex point on the surface of a Bézier object. Adding a point causes the surface patch on which the point is added to sub-divide into more (and smaller) patches. You can only add vertex points to Bézier objects.

Render tool. This tool is provided so that you can render the object in its current state of progress as you manipulate the points.

Comparing Bézier and Polygonal Objects

Vertex points are always visible on Bézier objects; they are not visible on polygonal objects. Polygonal objects also have vertices; they are at the intersection of the triangulated polygons. But, because there

are usually so many, to avoid confusion they only show when selected.
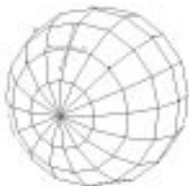
Bézier object:
• Rectangular surface
• Vertices always show
• Direction handles on selected vertices

Polygonal object:
• Triangulated surface
• Vertices show only when selected

Bézier vertices are normally black, and turn red when you select them. Polygonal vertices appear red when they're selected. Bézier vertices have direction handles attached, allowing you to bend or warp the surface. Polygonal objects do not have direction handles. When you move a Bézier vertex, the adjacent surface patches follow in a spline-like fashion. When you move polygonal vertices, adjacent polygons simply stretch or contract. You can also add and remove vertex points to a Bézier object.

Reshaping Polygonal Objects

To edit a polygonal object, simply click on one or more vertex points and drag any direction. The surface of the object redraws to show the changes.

Select a vertex point and drag.
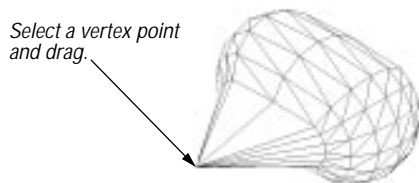
You can pull more than one vertex point at a time. For example, to stretch a sphere into an ovoid, select multiple points by shift-clicking or using a selection marquee. Then, drag them in unison.
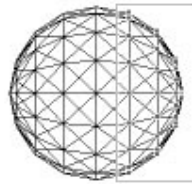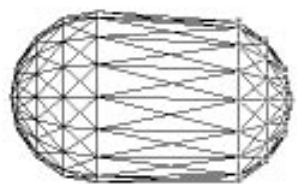
Select multiple points   and all points move in unison.

NOTE *You can only select vertex points that are visible; therefore, you must be in either Wireframe or PointCloud display modes in order to select backfacing vertex points.*

To move points perpendicular to the active grid, use the Command + Shift keys. A temporary grid line appears to assist you in the proper placement of the selected vertex points.

Gravity

Pulling a single point often results in sharp spikes coming out of the object. If you want a more rounded effect, you can turn on *Gravity*.

To enable *Gravity*, double-click the Move Point tool to display the *Tool Settings* dialog.
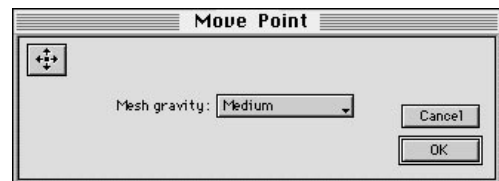
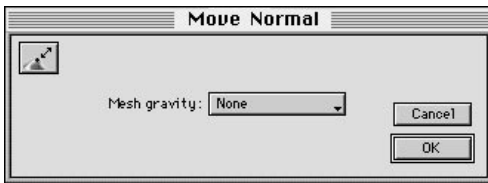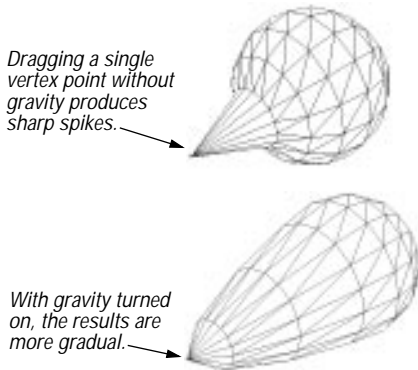You can also specify the degree to which gravity effects the move operation. You can select *None*, *Low*, *Medium*, or *High* from the *Mesh gravity* pop-up list.

You can also enable *Gravity* on the Surface Normal tool. Double-click the tool to display its *Tool Settings* dialog.
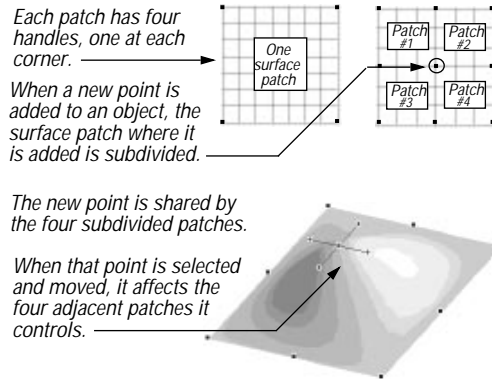

When *Gravity* is enabled, the distance other vertices move lessens with their distance from the vertex being dragged.

Dragging a single vertex point without gravity produces sharp spikes.

With gravity turned on, the results are more gradual.

Reshaping Bézier Objects

It's easier to work with Bézier objects if you understand how surface patches are constructed and manipulated. The following illustration describes the basic structure. Think of a simple rectangle, with its single surface patch, as a sub-set of more

complex objects with multiple surface patches; the behavior is the same.

Each patch has four handles, one at each corner.

When a new point is added to an object, the surface patch where it is added is subdivided.

The new point is shared by the four subdivided patches.

When that point is selected and moved, it affects the four adjacent patches it controls.

As long as the vertex point you are moving is shared by adjacent patches, the surface responds in a smooth, predicable way. Most vertices are like that.

Adding Vertex Points

Use the *Add Point* tool to add a point. You can add a vertex point and begin dragging it immediately. You don't have to release the mouse button between adding the point and dragging. The window redraws to show any changes in the geometry.

Whenever you add a point to a Bézier surface patch, it subdivides. This requires additional memory. To conserve memory, you should avoid adding more points than you need.

Deleting Vertex Points

Select the points you wish to remove and press the Delete key. The object will redraw to show its new form. You can **UNDO** the deletion if you don't like the results.

Hinging Direction Handles

To hinge a vertex point so that you can move its direction handles independently, hold down the Option key while dragging the direction handle you want to hinge.
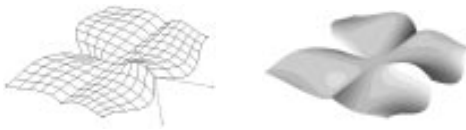
To create a crease in the surface of an object, "hinge" the vertex point by holding down the Option key while dragging one of its direction handles.

Hinged vertices allow you to crease the surface. Aligning them makes the surface smooth at that point.

If the vertex point has four direction handles attached to it, only one set of handles are hinged when you use the Option key. The other handles that pass through the point aren't affected unless you also drag one of those handles with the Option key. Once you hinge a set of direction handles, you can drag them again without holding down the Option key.

Aligning Direction Handles

To align the direction handles of a vertex point that you have previously hinged, grab one of the handles and visually align it with the opposite handle. When it's properly aligned, the handles snap into position.

An **ALIGN HANDLES** button is also provided on the Button Bar that can be used to align selected direction handles. This command is especially

useful when a single set of direction handles reside on two different planes.

2-D RESHAPE

The **RESHAPE** command allows you to reshape 2-D objects after you have drawn them. This includes the 2-D construction elements used for creating objects with the various modeling tools:

If a **Lathe** object is selected, the **RESHAPE** command allows you to edit the 2-D profile used in the Lathe operation. When you select the command, the profile appears with its direction handles.

If an **Extrude** object is selected, you can manipulate the vertices to edit either the face or the bevel.
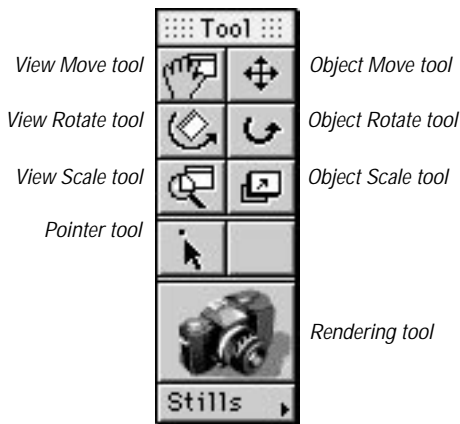

If a **Path Extrude** object is selected, direction handles appear on the control points of both the template and the path.

If a **Skin** object is selected, you can change the position, rotation, or scale of the ribs at different times on the timeline to animate the skin object. If you want to change the geometry of the ribs, you'll need to unskin the object first. Then, with the ribs selected, you can select the **RESHAPE** command to edit the ribs, and then Skin the ribs again.

NOTE *To push or pull individual points on the surface of any of these 3-D objects, you must first convert*

them to another object type. Once converted, you can then use the **RESHAPE** command to edit the vertex points of the 3-D entity. However, once converted to another object type, it cannot be converted back into its original object type again.

When you select the **RESHAPE** command, the Tool Palette changes to provide the tools required for reshaping 2-D objects.

View Move tool — Object Move tool
View Rotate tool — Object Rotate tool
View Scale tool — Object Scale tool
Pointer tool
Rendering tool

The top six tools provide the same function in Reshape mode as they do during modeling. The Object Move, Rotate, and Scale tools apply to objects in the modeling window, not to individual vertex points.

Pointer tool allows you to select one or more vertex points and drag them in the workspace. No pointer tool is required for reshaping skin objects; the object manipulation tools are used for moving, rotating, and scaling the ribs of a skin object.

As you edit an object, you can zoom in to work on a specific area. When you want to see the entire object in the view again, you can use the **FIT VIEWS TO SELECTION** com-

mands from the Windows menu. This is a quick way to accomplish the task, rather than use the zoom out option on the magnify tool.

This is especially useful if you have dragged some of the vertices outward to the edge of the workspace. This provides more room to move them further if desired, because the workspace will be made larger automatically to accommodate the larger object.

Editing Vertex Points

If the 2-D object you are editing is a polygonal object, you can reshape it by simply clicking on a vertex point and dragging the point to the desired position.

If you're editing a Bézier object, there are usually fewer points. You can move these points just as you would move points on a polygonal object, but each point also has direction handles attached. These handles allow you to bend the edges of the object if it is closed, or the line segments between points if it is an open polyline.

You can select and move more than one vertex point at one time. To select multiple vertices, you can either drag a marquee around them, or click on the points one at a time while holding down the Shift key. Then when you drag one of the selected vertices, all of the selected points move in unison. If all vertices are selected, moving one vertex point moves the entire object.

To deselect all vertices, click anywhere in the window away from the object.

Changing the Beginning Vertex Point

All 2-D objects have a beginning and ending vertex point. The green handle indicates the beginning point; the red handle is the ending point. All other vertices are square and black.

To make a different vertex point the first point, select the desired vertex point, then click the **MAKE FIRST POINT** button on the Button Bar. The selected point becomes the first point.

The location of the beginning point on an object is usually determined by the sequence in which the vertex points are created when the object was drawn in the modeling window. However, some tools just arbitrarily pick a point.

Usually you do not care which vertex is the beginning point, but there are some situations where you may need to shift the beginning point to align it with beginning points on other 2-D objects.

Creating ribs for a skin object, for example, is one situation where the position of the beginning vertex point is very important to the result.
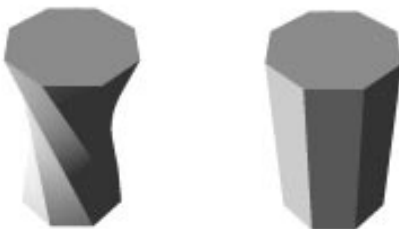
The location of the first point can effect the appearance of a Skin object. If the beginning points on the two ribs are not aligned, the final skin object appears twisted.

Removing and Adding Vertex Points

In addition to moving vertices, you may want to remove or add some vertices. You may add or remove vertices from either type of 2-D object, polygonal or Bézier, in the same manner.

Note that you cannot delete all the vertices from an object. A minimum of two vertex points are required for either a line or a closed Bézier object; three points are required for a closed polygonal object. To delete the entire object that you're currently reshaping, you must first exit Reshape mode by selecting the **END RESHAPE/EDIT** command and delete the object from the model.

Deleting Vertex Points

With the Pointer tool, select the points you wish to remove and press the Delete key. The object will redraw to show its new form. If you don't like the results, you can **UNDO** the deletion and try something different.

Adding Vertex Points

Hold down the Option key while positioning the cursor on an edge or line between two other points. Then, when the cursor changes to a plus (+) shape as it intersects the line, simply click the mouse button to add a vertex point. Unless the cursor changes to a plus (+), there is no edge detected and clicking the mouse button will not add a vertex point.

You can add a vertex point and begin dragging it immediately. You do not have to release the mouse button between adding the point and dragging. When the

mouse button is released, the window redraws to show the new point and any changes in the geometry.

Working with Bézier Splines

The vertex point determines the absolute position of the line path or object edge as it passes through that point. Each vertex point has two direction handles that control or influence the curve of the line segment between it and the next point on either side.
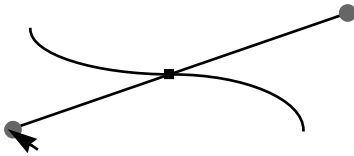
The farther a direction handle is pulled out from its vertex point, the more force it applies to its line segment to bend or curve it. Direction handles are moved by clicking and dragging them.

Dragging Out Collapsed Direction Handles

If either one of the direction handles for a particular vertex point is not visible, it is because it has a zero force and is on top of the vertex point. No bending force is being applied to the line segment on that side of the point. However, you may want to change that part of the line or object.

To pull a direction handle off of a point, you must hold down the Command key while click-and-dragging that point. With the Command key down, the vertex point remains stationary and the direction handle is selected and dragged instead. If

both direction handles are on top of the vertex point, the topmost handle is dragged out first. To get the other handle, you must repeat the process.

Once a direction handle is away from a vertex point, you can click-and-drag it without using the Command key. The Command key modifier can also be used if a direction handle from one vertex point happens to fall on top of another point. Without the Command key, clicking on the direction handle will always select the point instead, since points are given precedence over direction handles.

Collapsing Handles

To collapse the handles, drag the handle to overlap the vertex point, then release the mouse button.

Hinging Direction Handles

You can hinge the vertex points so that the line or object edge is free to make sharp angles at the point. When a vertex point is hinged, its direction handles can be moved independently to adjust the curve of the line segments separately on either side of the point. Moving one direction handle has no effect on the other handle.
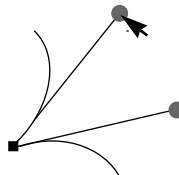
To hinge a vertex point, hold down the Option key while dragging one of the direction handles. You can drag it without

the opposite handle moving. Once you break the alignment between direction handles for a particular point, either handle can be later moved freely without using the Option key again.

Aligning Direction Handles

Vertices usually have direction handles that are aligned with the line passing through that point. When the direction handles are aligned, they are hooked together. Adjusting one handle also moves the one on the other side.

To re-align previously hinged direction handles, grab one of the handles and move it until it is visually aligned with the one on the other side of the point until it locks into position. When you release the mouse button, the direction handles become linked together. If you move one of the direction handles again, the other follows.

You can also click the **ALIGN HANDLES** button on the Button Bar. This command is especially useful when a single set of direction handles reside on two different planes. In this case, you may not be able to re-align these previously hinged handles into position by simply aligning them visually.

Modifier keys used with the RESHAPE command:

- **Shift key** extends the selection of points. Without the Shift key, you can only select one point at a time. With the Shift key held down, if you select a point that is already selected, that point becomes deselected.

- **Command key** is used to drag out collapsed direction handles. Without the

Command key, the point moves instead of the handles.

- **Option key** is used to hinge direction handles so they can be moved independently.

- **Option key**, while in 2-D Reshape, can also be used to add a point to a line. Hold down the Option key; when the cursor intersects the line, the cursor changes to a Plus symbol (+). Click to add a point.

- **Command** + **Shift keys** let you move the selected vertex point perpendicular to the active grid. (2-D regions must reside on a single plane; therefore, individual vertex points cannot be moved perpendicular to the grid.)

EDIT PLACEMENT

When you select this command, a list of the all textures applied to the selected object appear in a sub-menu. This command lets you position the selected texture on the object, as desired.
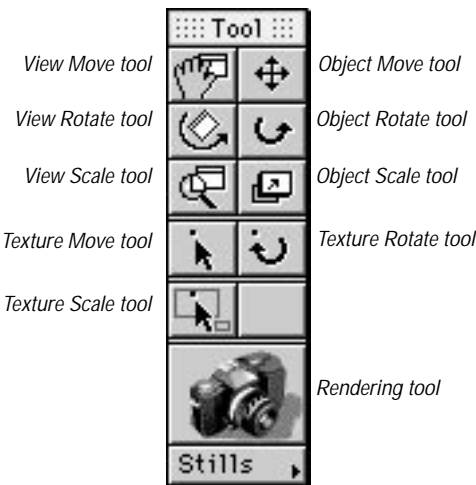
You can also access this command with the **EDIT PLACEMENT** button on the Button Bar. Clicking this button lets you edit the placement of the topmost texture applied to the selected object.

The command is also available by clicking the *Position* button on the *Textures* tab of Object Properties Palette for the selected object.

If you want to position the texture on an object in a separate window, rather than in the modeling window, double-click on

the object. Double-clicking on an object places that object in a separate window. Then select the **EDIT PLACEMENT** command from the menu. Now you can reposition the texture on the object without other objects hindering the process.
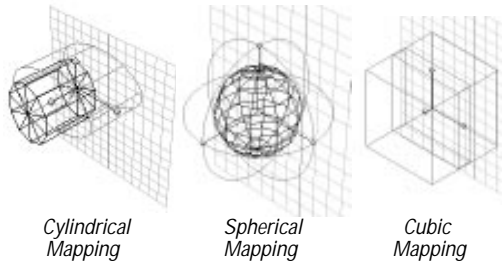
The Tool Palette changes to display only the tools you need to change the position or alignment of the texture on the object. The top six tools are provided for use on the object itself, and three additional tools are provided for manipulating the texture. The Rendering tool is also available for previewing the current placement on the object.

View Move tool *Object Move tool*

View Rotate tool *Object Rotate tool*

View Scale tool *Object Scale tool*

Texture Move tool *Texture Rotate tool*

Texture Scale tool

Rendering tool

When you select the **EDIT PLACEMENT** command from the menu, handles appear on the selected object. You can move, rotate, or scale the texture as desired.

The handles allow you to place the texture precisely where you want it. The

mapping style you selected is reflected by the appearance of the handles.

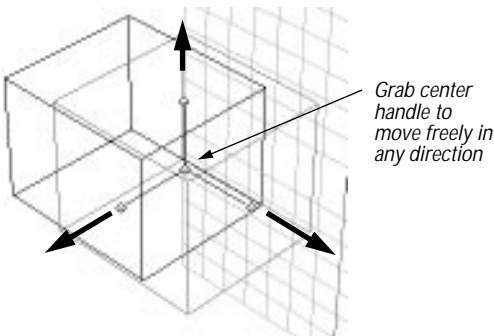*Cylindrical Mapping* *Spherical Mapping* *Cubic Mapping*

A special **FIT TEXTURE** button is provided on the Button Bar that allows you to center the texture on the object with 100 percent coverage. This is the default texture orientation. You can use this feature at any time during the texture placement process.

MOVING TEXTURES

Select the Texture Move tool to reposition the texture on the object.

Grab a face handle to constrain the movement of the texture perpendicular to the plane of the selected handle.
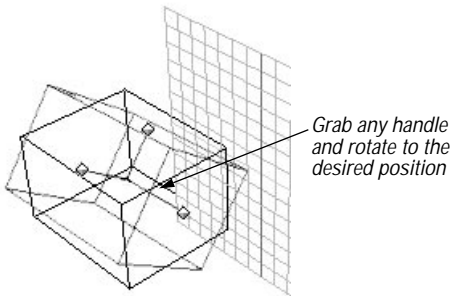
Grab center handle to move freely in any direction

Grab the center handle to move the texture freely in any direction. It can be placed anywhere on the object.

ROTATING TEXTURES

Select the Texture Rotate tool to rotate the selected texture on the object.

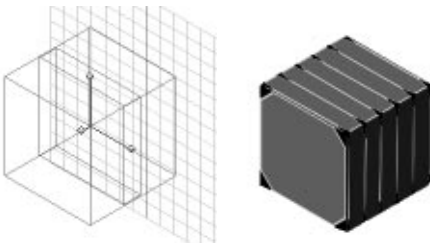*Grab any handle and rotate to the desired position*

Grab the rotation handles and rotate to the desired position.

SCALING TEXTURES

Select the Texture Scale tool to scale the selected texture on the object.

Changes you make to the scale of the texture are reflected on the *Textures* tab of the Object Properties Palette. Scaling the texture maps affects the way in which the maps tile onto the surface of the object.

When you're finished positioning and aligning the texture on the object, select the **END RESHAPE/EDIT** command from the menu or click the **END RESHAPE/EDIT** button on the Button Bar.

EDIT SELECTED

When you select this command, a sub-menu of all the editable attributes applied to the selected object appears. Editable attributes include items such as textures, effects, URL addresses, etc.

Generally, if the attribute has a dialog associated with it, that attribute is editable and will appear in the list. Select the attribute that you want to edit. The appropriate dialog is displayed.

For example, if you select a texture from the sub-menu, the *Texture Editing* dialog for that texture appears, allowing you to edit the texture. You can't edit the position of the texture on the object with this command, only the texture itself. If you select URL address, the dialog associated with the URL address opens, allowing you to edit it.

END RESHAPE/EDIT

COMMAND-E

Use this command when you're finished reshaping an object or editing the attributes of an object. This command exits the various modes invoked after selecting one of these commands:

> RESHAPE
>
> EDIT PLACEMENT
>
> EDIT SELECTED

You can also use the **END RESHAPE/EDIT** button on the Button Bar to exit any of these modes and return to basic modeling mode.

CONVERT

The **CONVERT** command allows you to change an object from one type of geometry to another.

You can also access this command by clicking the **CONVERT** button on the Button Bar.

There may be several reasons for wanting to convert an object from one type to another. You may want to animate the ribs of a Path Extrude object, for example. Or, you may want to reshape the object in a manner that is not allowed with the current object type, such as pushing or pulling points on the surface of a lathe object. In order to accomplish this, you would first need to convert the lathe object into a polygonal or Bézier object.

Once you convert an object from one type to another, the link to its native modeler or

tool is broken, and you may not be able to convert it back to its original object type again. Depending on the conversion you select, a warning dialog may appear, warning you of the consequences of that particular conversion.

For example, if you convert an object created with the Extrude tool into a polygonal mesh, you will not be able to edit the Extrude parameters again. The **RESHAPE** command will now allow you to push and pull individual vertices, but you can no longer edit the template or the bevel of the object because the object is no longer linked to the Extrude tool.

Select the object(s) you want to convert; then select the **CONVERT** command from the menu to display the *Convert* dialog. All of the allowable conversions appear in the dialog. Those that don't apply to the selected object(s) are dimmed and unavailable.


- **One sided**. This check box allows you to specify whether the object is one-sided or two-sided after the conversion operation.

  If you are planning to apply a transparent texture with refractive properties, or a volumetric effect such as *Fog* or *Mist*, it must be created as a solid, one-sided object.

- **Breaking angle**. This field sets the maximum angle between adjacent polygons. If the angle of incidence is greater

than this value, no smoothing occurs at this particular boundary, and the surface will appear creased. The range for this field is from zero to 180 degrees. Generally, the higher the value, the smoother an object appears. Lower values result in a more angular appearance of the surface

30° breaking angle   *90° breaking angle*
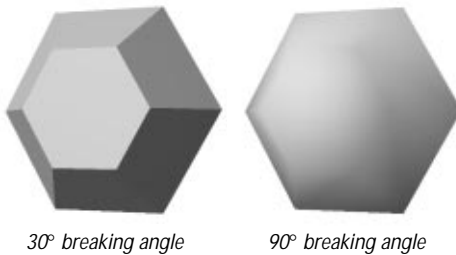
If this field does not apply to the conversion method selected in the dialog, it appears dimmed.

StudioPro utilizes the following hierarchical structure when converting objects from one type to another.

Skin
↓
Bézier
↓
Polygon Mesh
↓↑
Polygons
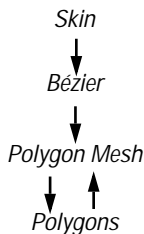
A *Skin* entity can be converted downward to *Bézier, Polygon Mesh,* or *Polygons.* A *Bézier* object can be converted downward to *Polygon Mesh* or *Polygons.* A *Polygon Mesh* object can be converted downward only to *Polygons.* The only conversion that can be take place in the opposite direction (upward in the hierarchy) is a *Polygons* to *Polygon Mesh* conversion.

NOTE *Lathe, Extrude, and Path Extrude objects can all be converted to Skin objects. For information on working with Skin objects, see Skin on page 211.*

ALIGN

COMMAND-/

The **ALIGN** command allows you to align selected objects on the horizontal, vertical, or depth axis, either separately or in any combination of the three. **ALIGN** is available whenever two or more objects are selected.

The *Align* dialog allows you to specify which combination of alignments you want. When you first open the dialog, the settings default to *No Change* on each axis.

The alignment options in the dialog box (left, center, top, front, etc.) are relative to the front view in world coordinates. You can align the objects horizontally by either their left or right sides, or by their centers. The vertical alignment can be by the tops, bottoms or centers of objects, and depth alignments are by front, back or object centers.

If none of the selected objects are locked, the location of the outermost object on each axis determines the boundary for the edge alignment point. Objects are moved to the point of alignment on each axis chosen. If the position of one of the selected

objects is locked (on the *Transform* tab of the Object Properties Palette), the command uses the outermost extents of the locked objects as the alignment boundaries.

RE-CENTER

The **RE-CENTER** command positions the object's origin point back to its geometric center after the origin point has been moved. The **RE-CENTER** command is available whenever an object is selected. If more than one object or group is selected, each origin point is re-centered.

The object origin point is the point around which the object rotates. This point is not necessarily at the geometric center of the object.

When the display method is set to *Wireframe* or *PointCloud*, you can see the object origin point whenever an object is selected. It appears as a small blue diamond.

When you first create an object, the origin point is located at the geometric center of the object. However, you may want to move the origin point to a new location. The position of the origin point can affect the object in the following ways:

• It sets the axis for rotation on the object.
• It is where a child object is linked to its parent.
• It locates the object on its animation path.

To move the origin point without moving the object itself, hold down the Command key while dragging the origin point to its new position. This position now becomes the point around which the object rotates. Instead of grabbing the origin point, if you hold down the Command key and grab the object, the object moves and the origin point remains stationary.

You can move the origin point in any direction on the active grid or in a plane parallel to the active grid. To move the origin point perpendicular to the active grid, you must switch to a perpendicular grid.

The **RE-CENTER** command is the easiest method for putting the origin point back in the geometric center of an object, although you can reposition it back to it's center manually, as well.

The origin point of objects imported from other applications may not be located in the geometric center. You may need to use the **RE-CENTER** command on objects after importing them into your model.

Modifier keys that apply to POSITIONING object origin points:

• **Command key** moves the object origin point without moving the object. Without the Command key, the object moves with the origin point.

• **Command** + **Shift keys** constrain the motion of the origin point to 90-degree increments on the active grid, or on a plane parallel to the active grid. Unconstrained, the origin point can move diagonally.

You may need to use the **RE-CENTER** command for a number of reasons:

- **After linking two objects**. For example, you might want the child-object to rotate about its own geometric center rather than the parent's. (When you link one object to another, the child's origin point moves to the position of the parent's origin point.)

- **After manually moving the origin point for some operation**. This is often done for special rotation needs.

GROUP

COMMAND-G

Use the **GROUP** command to combine two or more objects into one. This command is available whenever any individual objects or groups are selected. There can be as many grouping levels as desired.

This command is also available by clicking on the **GROUP** button on the Button bar.

You can group any combination of objects, cameras, and/or light sources together. Once grouped, they act as one object. You can perform the same basic operations on a group that you can perform on a single item. When a group is established, its coordinate system is aligned to the active grid.

When selected, groups always appear within a single bounding box. A group can contain other groups; for example, two or more groups can be grouped together.

This command can also be used with single objects. There may be times when you want the object's coordinates aligned to the grid. Once you rotate an object, for example, its own coordinates may no

longer be aligned to the grid, and moving the object perpendicular to the grid may be difficult. When you group an object, a new set of coordinates is established for the group, with its new coordinates aligned to the active grid. Therefore, once you group the object, you can grab the handle parallel to the active grid and move the object away from (perpendicular to) the grid. Then, after you've moved the object, you can ungroup it to restore its previous coordinates.

You can't access individual objects within a group. However, you can still access shapes that are part of a group in their own shape windows using the commands provided in the Plus menu on the *Shapes* tab of the Resource Palette. Any changes you make to a shape in its workspace will appear in any instances of the shape, even if it is inside of a group at the model level. To access individual objects, you must ungroup them first.

It may be easier to work with a group in its own window. You can open a group in its own window by double-clicking on the group. For example, you may want to change the relative position of the individual objects within the group. If the model is complex, it may be difficult to access parts of the group without affecting other objects. You can double-click on the group so it opens in its own window, ungroup the objects, change their position, then regroup the objects together again.

UNGROUP

COMMAND-U

Use the **UNGROUP** command to split grouped objects into separate objects

again. You can access this command any-time one or more grouped objects are selected.

 You can also select the **UNGROUP** button on the Button Bar.

When a group contains other groups, only the outermost group is affected by the **UNGROUP** command. Each time you use this command, the next level is ungrouped.

Each object's previous coordinate system is re-established when ungrouped.

You can ungroup shape instances at the model level also. However, when a shape instance is ungrouped, it loses its hierar-chical connection to the shape, and it becomes a regular object. It may be better to edit the shape instance in a Shape window instead.

PATH

ALIGN and **UNALIGN** are part of the Align to Path modeling extension; therefore, the Align to Path extension file must be present in the *Strata StudioPro Extensions* folder at the time the application is launched. If the extension isn't present, neither the **ALIGN** nor the **UNALIGN** com-mands appear in the menu.

ALIGN

Select the **ALIGN** command from the Path sub-menu to align an object to any anima-tion path to which it may be associated, either currently or in the future.


You control which direction the object is pointing as it travels along its path. This command also allows you the option of having your object "bank" on turns as the animation path changes direction.

 You can also access this command by clicking the **ALIGN TO PATH** button on the Button Bar.

To use this command, you must have an object selected in the modeling window. When you select the **ALIGN** command from the Path sub-menu, the *Align to Path* dialog appears, displaying a representa-tion of the selected object with controls to orient it relative to its animation path.
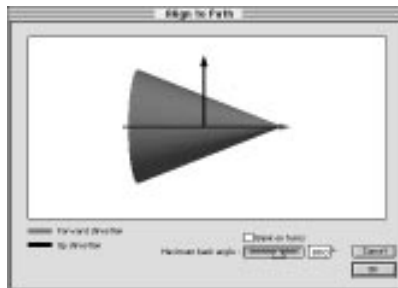
Two directional pointers, one indicating the forward direction and one indicating the up direction, are overlaid on the selected object. You specify which parts of the object represent *forward* and *up*. The object's *forward* point will be rotated so it always points in the direction the object is moving. The *up* point will always be aligned perpendicular to the "best fit" plane in which the object is moving. Use the cursor to click on any of the selection handles, and then drag to rotate the object in the desired direction.

When you release the mouse button, the object is redrawn to show its new alignment along any path to which it's attached. This dialog also gives you the option of having the object "bank" on turns as the animation path changes direction. The slider allows you to specify the approximate maximum banking angle that may be used over the entire animation. When the *Bank on turns* option is disabled, the object's *up* point always remains pointing in the same direction.
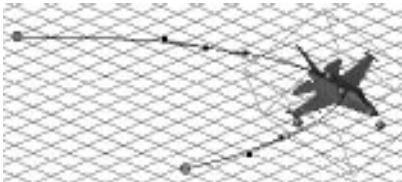
"Bank on turns" feature enabled.
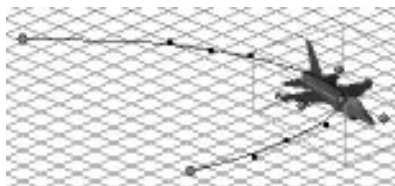
"Bank on turns" feature disabled.

Once an object is aligned to a path, it cannot be rotated with the Rotate tool. The forward and up alignment of an object is time varying.

UNALIGN TO PATH

UNALIGN TO PATH is part of the Align to Path modeling extension; therefore, the Align to Path extension file must be present in the *Strata StudioPro Extensions* folder at the time the application is launched. If the Align to Path extension isn't present, the **UNALIGN TO PATH** command won't appear in the menu and can't be accessed.

This command is provided to remove the **ALIGN TO PATH** constraint from an object. Select the object, then select the **UNALIGN TO PATH** command from the menu. The object will no longer automatically point forward as it travels along its path.
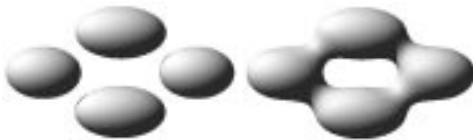
METABALLS

Metaballs is a modeling extension; therefore, the Metaballs extension file must be present in the *Strata StudioPro Extensions* folder at the time the application is launched. If the extension is not present, the command will not appear in the menu and cannot be accessed.

JOIN

The **METABALLS** command lets you transform separate elliptical shapes into a sin-

gle, smoothly-blended entity. You can create and animate spheres that seem to melt together as they come close to one another.

Spheres before Metaballs   *Sphere of Influence = 2.0*

Sphere of Influence = 2.5   *Sphere of Influence = 3.0*

Points inside any sphere are always part of the Metaball. A point in space, not inside a sphere, becomes part of the Metaball if the combined sum of all contributing spheres is sufficiently large.

To use the Metaballs modeler, first select two or more spheres to use in the Metaballs operation, and select the **JOIN** command from the Metaballs sub-menu.

A Metaball entity is created immediately after selecting the command.

 You can also access this command by clicking the **METABALLS** button on the Button Bar.

If two or more ellipsoids are not selected, or if any of the selected objects are not ellipsoids, the command and the button are dimmed and unavailable.

You can select any ellipsoid created with the sphere tool; it does not have to be a perfect sphere. Although the Metaball operation supports spheres of any size or proportion, it works fastest with those that are approximately the same size and of nearly equal proportions.

Select single spheres only; grouped spheres must be ungrouped before they can be used. Any number of spheres can be used in a single Metaballs operation, assuming enough memory is available. Spheres that have been converted to other object types are no longer spheres, and cannot be included in a Metaballs operation.

If you animate the spheres beforehand, the motion will be incorporated in the final entity. For example, if you script the spheres to travel toward each other from a distance, pass through each other, then travel away from each other again, the rendered animation will show the spheres traveling toward a shared point in space, globbing together as they get closer to that point until they seem to become a single sphere, and then pulling apart into individual shapes again as they go their separate ways.

Any textures that were applied to the spheres before the Metaball modeler is used will not appear on the Metaball entity. Once the Metaball operation is complete, textures can be re-applied.

Editing Metaballs

To rearrange the spheres within an existing Metaball, you must unjoin the Metaball with the **UNJOIN** command, re-arrange the spheres, and then rejoin them. This process is relatively simple because the *Unjoin* operation leaves all contributing spheres selected; they can be moved, rotated, or scaled individually, and rejoined into a Metaball without selecting or deselecting anything. Using this process, the previous *Radius of Influence* is also restored. (*See **Object Properties Palette** below.*)

Once you've created a Metaballs entity, you can edit it on the *Object* tab of the Object Properties Palette.
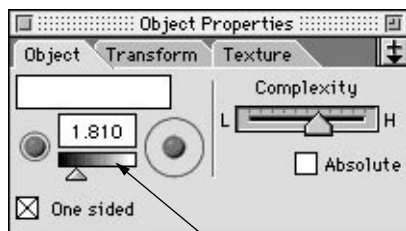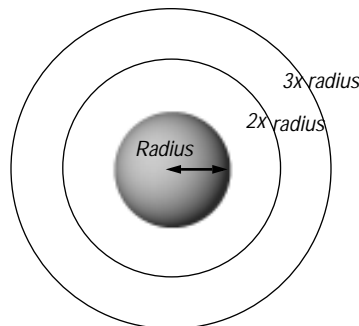

Radius of Influence slider

• **Name**. This field contains the name of the Metaball entity. You can add a name, or change the existing name in this field at any time. The name is also reflected in the *Object* list of the Project Window.

• **Radius of Influence**. The *Radius of Influence* slider determines when and to what extent the spheres will merge. Moving the *Radius of Influence* slider to the left reduces the radius of influence, so the spheres need to be relatively close together for the globbing effect to appear. Sliding the bar to the right increases the sphere's influence, allowing the spheres to be farther apart while still affecting each other.

A value of 2.0 creates a sphere of influence with a radius that is twice the radius of the sphere itself. A value of 3.0 creates a sphere of influence with a radius three times the radius of the sphere.

Acceptable values for *Radius of Influence* range from 1.1 to 5.0. The Metaballs modeler initially uses a default radius of 1.5.

When you change the *Radius of Influence*, the radius specified becomes the default setting for future Metaballs operations. The new default setting remains in effect until the radius is changed again, or until you unjoin an existing Metaball with the **UNJOIN** command from the Metaballs sub-menu. If

you unjoin a Metaballs entity, the radius setting of that entity becomes the new default setting. The *Radius of Influence* is not time varying.

• **Complexity slider**. The position of this slider determines the complexity, or amount of detail, with which the Metaball entity is rendered, either in the modeling window or in the final image. It does NOT change the complexity of the entity (which is defined mathematically), but only the way the polygon renderers display it.

• **Absolute check box** - When this box is *unchecked*, the slider indicates a relative complexity based on the maximum allowed by that renderer. The range of complexity is also affected by the size of the Metaball entity and its proximity to the view plane.

When this box is *checked*, the slider indicates the EXACT percentage of the maximum complexity allowed.

UNJOIN

This command lets you undo the Metaballs operation on the selected Metaball entity. If no Metaball entity is selected, the button is dimmed and not available.

You can also access this command by clicking the **METABALLS - UNJOIN** button on the Button Bar.

When you **UNJOIN** a Metaballs entity, the radius of that entity becomes the new default setting for future Metaballs operations. This simplifies the process of editing a Metaball entity. (*See **Editing Metaballs**, above.*) This default setting remains in effect until a new radius is specified in the Object Properties Palette, or until you unjoin another Metaballs entity.

If you **UNJOIN** a Metaballs operation, textures applied to the Metaball entity are lost, and any textures that were originally applied to the spheres BEFORE the Metaballs operation will be restored to the individual spheres again.

The Rendering menu includes commands for specifying the various options that relate to rendering images.

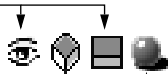rendered, and the image size and resolution.

RENDER

COMMAND-R

Use the **RENDER** command to begin the rendering process. This command is available whenever a model, shape, or camera window is active.

It is important to remember that there are settings in the Project Window that may affect the outcome of the final rendering.
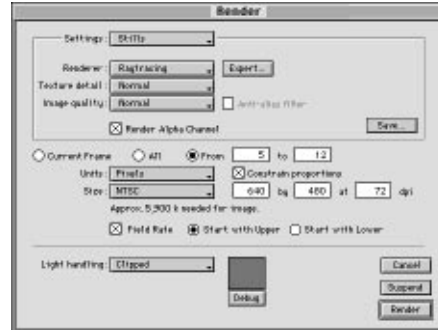
*These icons determine
if the object renders*

This icon controls shadow casting

These settings determine whether or not an object appears in the rendering or if it casts shadows. Each object has its own settings. For more information, *see* **Project Window** *on page 219.*

When you select the **RENDER** command, the *Render* dialog opens, allowing you to choose the rendering method, image quality, set the frame or number of frames to be

SETTINGS

You can set the options and values in the dialog to previously defined settings. It can be one of the standard StudioPro configurations; or, if you previously saved any of your own configurations from this dialog, they will also appear in the *Custom* sub-menu. *See* **Saving Custom Settings** *on page 61* for more information on creating your own rendering settings.

RENDERER

The available rendering algorithms appear in the *Renderer* pop-up list. Select a rendering method that only supports those features that actually contribute to the image.

PointCloud
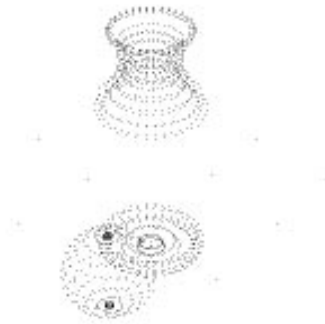
PointCloud is the simplest and fastest rendering method used by StudioPro. Only the vertices are rendered. It is used primarily for displaying your model in the modeling window, but it can also be useful for rendering animation sequences for previewing purposes.

Wireframe

Wireframe is generally used for displaying the model in the modeling window, but you can also use it to render images quickly. It generates a line representation of objects in a model. No surfaces, lighting, or surface shading are calculated. In wireframe, no surfaces are shown; surfaces are indistinguishable from hollow areas.

Flat
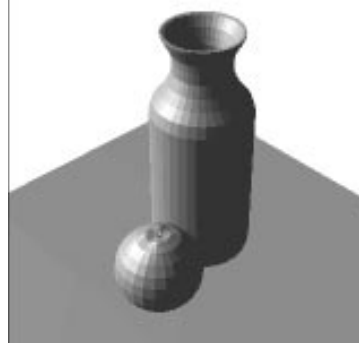
This rendering algorithm calculates a single color for each face on the surface. The orientation of a surface relative to the light source(s) illuminating it are also factored into the color as an intensity value.

Flat shading is relatively fast. However, it uses only one lighting calculation per polygon, so the final rendering is faceted in appearance. This renderer is most often used for preview-type images and animation development.

Shaded

The Shaded renderer calculates polygonal surface orientation and lighting intensity.

The objects are rendered with a smooth, shaded surface.

The Shaded rendering method can be used for displaying the model in the modeling window. It can also be used for rendering images and animations. This rendering method is relatively fast, but it doesn't include many of the features found in the higher level renderers.

Scanline

The Scanline renderer is capable of rendering quality images. It renders the image one line at a time.

This renderer provides a high-quality, photo-realistic rendering. It supports shadows, reflectivity, and transparency. The Scanline renderer is capable of rendering extremely small detail, including polylines, that may be missed by other rendering methods.

Expert Settings

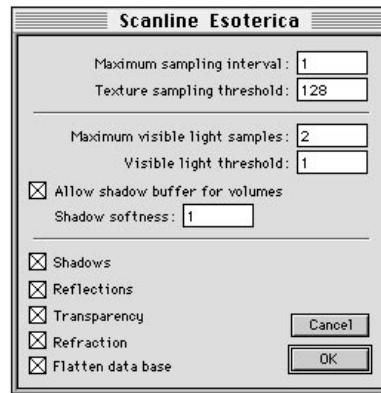When you select the Scanline renderer from the pop-up list of available rendering methods, the *Expert* button becomes available.

If you choose the Scanline renderer — *the Expert button becomes available.*

When you click the *Expert* button, the *Scanline Esoterica* dialog appears.

When you first install StudioPro, the default values present in the *Scanline Esoterica* dialog are designed to deliver the most efficient overall performance. You can customize these settings to fit your own specific requirements.

- **Maximum sampling interval**. The Scanline renderer starts with large blocks of pixels which are refined smaller and smaller during the rendering process. The refinement continues on every pixel block until the maximum block size is reached. At that point, the *Texture sampling threshold* setting decides which blocks to refine smaller. The Scanline renderer retains its ability to render fine details even

when larger block sizes are used. A setting of four in this field means a four-pixel by four-pixel block.

- **Texture sampling threshold**. When the maximum sampling interval is reached, the Scanline renderer scans the image block-by-block to see if it needs to be refined further. If two adjacent blocks of pixels have a difference in color values, this field determines the variation threshold, when it is significant enough for the Scanline renderer to refine the two blocks to resolve the difference. This process will continue until all adjacent blocks (pixels) are within the allowed percent of variation.

  Setting the value higher increases rendering speed, but may cause noticeable color banding of certain colors on curved, shaded surfaces. Setting the value lower forces all block sizes to be resolved finer, even if banding is not visible.

- **Maximum visible light samples**. The value in this field specifies the maximum number of times the light is sampled to determine the detail of shadow casting through objects to which volumetric effects have been applied.

- **Visible light threshold**. The value in this field determines the size of the visible light samples. Too large a number in this field results in coarser samples, and shadows cast through a volume may be missed.

- **Allow shadow buffer for volumes**. This option sets up a buffer to store pre-

viously sampled information to use for calculating the resulting shadows cast inside volumes. This option may reduce the rendering time for simple animations, but shadows are an approximation only.

- **Shadow softness**. This setting specifies the number of samples taken for calculating shadows.

- **Shadows**. This option determines whether or not shadows appear in the final rendering.

- **Reflections**. When this option is enabled, the Scanline renderer supports reflectivity.

- **Transparency**. This option enables transparency. When disabled, all transparent objects present in the model appear opaque in the rendered image.

- **Refraction**. This option enables refraction. Refraction is only available when transparency is enabled.

- **Flatten data base**. When this box is checked, all hierarchy is removed from the data base, and all instances are replaced by actual geometry for rendering purposes only. This will result in faster rendering times, but increases the amount of memory required. This option affects the rendering process only; it does not remove hierarchy from the model, nor does it change the model in any way.
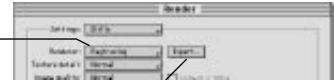
Raytracing

The Raytracing algorithm operates by following each ray of light striking the view plane backward through the model to its source. If a ray comes from light reflecting off an object's surface, the texture applied to that object helps determine what that reflected light should look like. That may include surface maps, reflectivity, shininess, or many other lighting factors. If the ray of light is coming from another object that is reflecting in the first object's surface, then the ray must be followed further backward from this surface to determine whether it came from another surface or from a light source.

This backward tracing continues until each light ray is accounted for, ending at either a light source or passing out of the scene. The minimum number of rays that must be traced is equal to the number of pixels in the image being rendered. The larger the image and the higher its resolution, the longer the rendering time. A 288 dpi image, for example, has four times as many rays to trace as a 72 dpi image of the same dimensions.

Expert Settings

When you choose the Raytracing renderer, the *Expert* button becomes available. Clicking this button displays the *Raytracing Esoterica* dialog box.

Choosing the Raytracing renderer...

allows access to the Raytracing Esoterica *dialog through this button*

The default values that are present when StudioPro is first installed are the settings designed to deliver the most efficient performance from the Raytracing algorithm. You can customize these settings to fit your requirements. Before changing these settings, however, you should thoroughly understand how these fields control the algorithm. Otherwise, you may adversely affect the speed and efficiency of the Raytracing renderer.
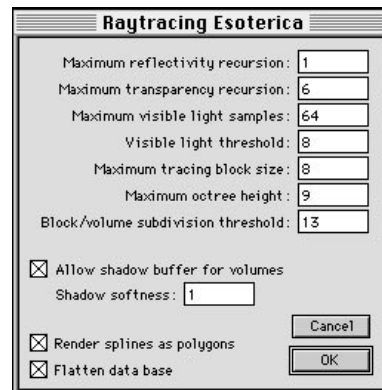
If you change the settings in this dialog, then want to return to the factory settings, just choose one of the preset rendering

options from the *Settings* pull-down menu in the *Render* dialog. The values in this dialog will revert to those shipped with the software.

The optimal values for the Raytracer can vary from project to project, depending on model size, available memory, the type of surface maps in the textures, etc. There are no wrong settings. Anything that slows down rendering speed without significantly improving image quality is less desirable than a configuration that gains performance while maintaining image quality.

The fields in the *Raytracing Esoterica* dialog and their effect on renderings are explained below:

• **Maximum Reflectivity Recursion**. This field determines how far a ray of light is traced as it reflects from surface to surface. It determines how many times an object will be reflected in the surfaces of other objects. The default setting is one. For most models this is adequate. Increasing this setting usually adds to the rendering time; however, if your model contains many reflective textures, you'll want to set this value higher.

• **Maximum Transparency Recursion**. This field's setting only affects models with multiple transparent objects positioned in front of each other. It determines how many layers of transparent surfaces the Raytracer will look through to see if there is something behind before giving up. If more transparency layers exist than this setting allows the Raytracer to look through, that area of the image will appear black. The default setting is six.

• **Maximum Visible Light Samples**. The value in this field specifies the maximum number of times the light is sampled to determine the detail of shadow casting through objects to which volumetric effects have been applied.

• **Visible Light Threshold**. The value in this field determines the size of the visible light samples. Too large a number in this field results in coarser samples, and shadows cast through a volume may be missed.

• **Maximum Tracing Block Size**. When creating an image, the renderer starts with large blocks of pixels which are refined smaller and smaller during the rendering process. The refinement continues on every pixel block until the maximum block size is reached. At that point, the *Block/volume Subdivision Threshold* setting decides which blocks to refine smaller. A setting of four in this field means a four-pixel by four-pixel block.

Larger block sizes render much faster, but may sometimes cause the Raytracer to miss fine detail. If your model has lots of detail work, either as surface maps or as explicit object geometry, you'll want to set this field smaller. In models that do not have fine details, a larger block size is usually preferred.

Setting the maximum block size smaller will not only ensure picking up the fine details in an image, but may actually render faster in those cases where it is needed. That's because starting with smaller block sizes at the start of a rendering doesn't waste time later by having to go back to find the detail that was missed, if it is found at all.

A tracing block size that is too large for the situation usually shows up as disappearing holes in 3-D text or the one-pixel lines in surface maps not showing up consistently. This becomes especially obvious in animations, where one frame contains detail, and the next frame does not.

- **Maximum Octree Height**. StudioPro's Raytracer sets up several octree levels during the rendering operation. An octree is an internal data structure used to subdivide the model space for more efficient handling and to simplify the ray tracing process.

  Initially, all objects are contained in one large cube or model space. The model space is first subdivided along the three axes into eight smaller cubes of the space. Each of those cubes may then be subdivided into another eight smaller cubes, depending on whether there are objects found in them. The various levels of subdivision is called an octree structure. Octal means eight, which is the number of smaller cubes created each time a larger cube is subdivided on each axis. The actual number of octree levels created for a particular rendering depends on the complexity of the model.

  Theoretically, the higher the number of octree levels, the faster the Raytracer will run. There is a point, however, when the octree structure becomes too big and it begins to take more and more time to maintain, negating any gains in its efficiency.

  This field determines the maximum number of levels in the octree. The higher this value, the more memory required. Higher numbers divide the

model space more finely, but take longer to set up and sort through. A lower value uses less memory, but may decrease efficiency.

- **Block/volume Subdivision Threshold** (percent). When the maximum tracing block size is reached, the Raytracer scans the image block-by-block to see if it needs to be refined further. It usually does. If two adjacent blocks of pixels have a difference in color values, this field determines the variation threshold, when it is significant enough for the Raytracer to refine the two blocks to resolve the difference. This process will continue until all adjacent blocks (pixels) are within the allowed percent of variation.

  Setting the value higher increases rendering speed, but may cause noticeable color banding of certain colors on curved, shaded surfaces. Setting the value lower forces all block sizes to be resolved finer, even if banding is not visible.

- **Allow shadow buffer for volumes**. This option sets up a buffer to store previously sampled information to use for calculating the resulting shadows cast inside volumes. This option may reduce the rendering time for simple animations, but shadows are an approximation only.

- **Shadow softness**. This setting specifies the number of samples taken for calculating shadows.

- **Render splines as polygons**. When this box is checked, all Bézier meshes are treated as polygonal meshes while rendering. This may significantly reduce

the time required for rendering, but may require additional memory. This option does not change the model in any way.

- **Flatten data base**. When this box is checked, all hierarchy is removed from the data base, and all instances are replaced by actual geometry for rendering purposes only. This will result in faster rendering times, but increases the amount of memory required. This option affects the rendering process only; it does not remove hierarchy from the model, nor does it change the model in any way. Under certain conditions the Raytracer may be forced to flatten the data base even if this box is not checked.

Raydiosity

The photo-realistic effects of lighting and reflection in scenes can be very complicated and subtle. Indirect lighting is particularly difficult to render. Raydiosity calculates the illumination caused by reflected light from nearby objects. This is called *inter-object diffuse illumination*. The effects are then included in the resulting image. Unlike Raytracing, which works best for highly reflective scenes, Raydiosity takes into account the distribution of light throughout the scene and is best

suited for images containing mostly matte surfaces and indirect lighting. Raydiosity also supports soft edges on shadows from spot and point light sources.

Raydiosity requires a substantial number of calculations. The Raytracer uses only a finite number of rays limited to the viewing position of the rendering, but the Raydiosity renderer is also capable of tracing rays that are not limited to the viewing position.

Expert Settings

When you choose the *Raydiosity* rendering method, an *Expert* button becomes available. Clicking this button opens the *Raydiosity Esoterica* dialog box. This second dialog also has a button to open the *Raytracing Esoterica* dialog. Since the Raydiosity renderer uses the Raytracing renderer to perform much of its work, those settings will also impact this renderer.
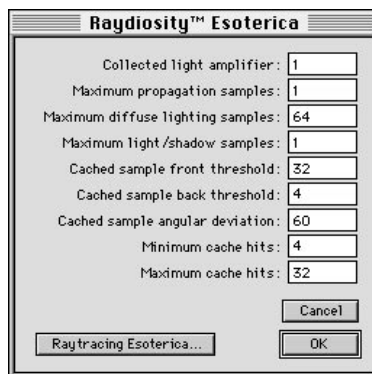
Every surface is considered a primary surface at some time during the rendering process. Which surface is primary and which is secondary (and third, fourth, fifth, etc.) depends on what ray of light the

Raydiosity renderer is tracing at any given moment.

Essentially, each time a ray of light reflects from a surface, the Raydiosity algorithm generates a cone of rays from the point of reflection to gather as much information as possible about the light that directly and indirectly influences the surface there. This information is cached for later reference.

The number and type of rays in that secondary cone are set in the *Raydiosity Esoterica* dialog. Each of the rays in the secondary cone can reflect off another surface and generate a cone of third-level rays, as well as a fourth, and a fifth, etc. The actual number of rays traced can be significant.

- **Collected Light Amplifier**. This field controls the brightness of the diffuse illumination. Values less than one reduce the brightness; values greater than one increase the brightness level.

- **Maximum Propagation Samples**. This field determines the maximum number of secondary rays that are generated when a primary ray strikes a reflective or transparent surface. The actual number of rays (not to exceed the number set in this field) is based on the roughness of the surface.

    A setting of one means just one secondary light ray is traced for every primary ray; a setting of two means two rays are traced for each reflected ray, etc.

- **Maximum Diffuse Lighting Samples**. This field determines the maximum number of secondary rays generated when a primary ray strikes a diffuse surface. Again, the actual number

depends on the roughness of the surface. This field determines how much other surfaces contribute to the appearance of a primary surface. This field is the setting that most significantly influences the amount of inter-object illumination or color bleed between adjacent objects.

A setting of one means just one secondary light ray is traced for every primary ray. The higher the value, the more the secondary objects influence the illumination of the primary object, and the longer the rendering time.

- **Maximum Light/Shadow Samples**. This field determines the number of rays traced to calculate the edges of shadows. It applies only to spot and point light sources.

    A setting of one means only one ray is traced for each pixel in a shadow area, which yields no softening of the shadows. Increase this number to generate higher samples between the shadows and the light sources. Higher numbers produce a softer edge to the shadows, but take longer to render.

- **Cached Sample Front Threshold**. This setting determines the coarseness of the previously cached samples to use in front of the point being computed.

    The higher the value, the coarser the sample. Lower values represent finer samples, but may require longer to render.

- **Cached Sample Back Threshold**. The setting in this field determines the coarseness of the previously cached samples to use behind the point being computed.

Higher values represent coarser samples. Lower values result in finer samples, but may require additional time to render.

- **Cached Sample Angular Deviation**. The Raytracer will include previously cached samples of reflected light from surfaces if their normals are within the angle specified in this field.

- **Minimum Cache Hits**. This value represents the minimum number of samples required. If the cache contains less than this number, more samples are taken by the Raytracer.

- **Maximum Cache Hits**. The value in this field specifies the maximum number of samples to use.

TEXTURE DETAIL

The *Texture detail* field is set independently of the rendering algorithm or the image quality. You can select *Fine, Normal, Medium,* or *Coarse* levels of texture detail. However, not all rendering methods can use all of the information contained in the texture. As the level of detail increases, the quality of the surface detail increases, as well as the length of time required to render the image.

The sampling rate is a global setting. Every object in the scene is sampled at the same rate. The finer the detail, the higher the quality, and the longer the time required for rendering. Use lower settings for preview renderings during modeling, then use a finer sampling rate for the finished image.

IMAGE QUALITY

The *Image quality* field determines the rendering detail for the quality of the final image. You can select *Preview, Normal, Smooth,* or *Extra Smooth* levels of image quality. The higher the image quality, the more time required for rendering.

The process of smoothing edges in an image is called anti-aliasing. In addition to simply rendering at a higher resolution, there are two other ways to achieve a smooth-edged image: super sampling and pixel averaging.

Super sampled anti-aliasing is used when the *Image quality* field in the *Render* dialog is set to *Smooth* or *Extra Smooth.*
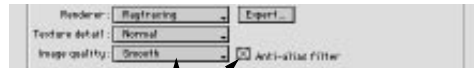
Choosing Smooth or Extra Smooth in the Image Quality field turns on anti-aliasing

The *Smooth* setting generates two pixels vertically and two pixels horizontally for each edge pixel in the final image. The *Extra Smooth* setting renders three pixels both directions.

Anti-aliasing by super sampling
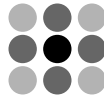
An anti-aliasing factor of three generates a 3x3 pixel grid centered around each pixel.
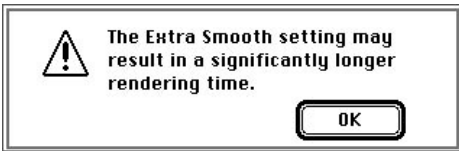
When the rendering is completed, the pixels are interpolated down to the one pixel used in the image.

The final image appears smooth because its pixels are the result of many extra samples taken during rendering.

If the anti-aliasing factor is set to *Extra Smooth*, an alert is displayed warning of the longer rendering times required for the extra resolution.

NOTE *If your image does not require this high of a resolution, you may want to select Normal Image quality, and then apply an anti-aliasing filter to the image after the rendering is completed.*

ANTI-ALIAS FILTER OPTION

This option is available when choosing either the *Smooth* or *Extra Smooth* Image quality setting. The anti-alias filter option is available with all but the lowest level renderers.

Although StudioPro uses super sampling as its primary method of anti-aliasing, pixel averaging anti-aliasing can be added to the super sampling to obtain an even higher quality image. This method alters the color of the pixels along diagonal lines or edges. The adjustment is proportionally weighted, based on how much of each pixel the line covers. Pixel averaging uses only the existing pixels at the base resolution to perform its smoothing. Because of that, this method of smoothing images can produce subtle blurring that may cause loss of fine details.

Pixel averaging can produce visually pleasing images without the need for higher resolution and larger file sizes. During rendering, pixel averaging anti-aliasing can be added to the super sam-

pling to obtain a vastly superior image. To enable this option, check the *Anti-alias filter* check box to the right of the *Image quality* menu.

RENDER ALPHA CHANNEL

The alpha channel is an eight-bit channel in the 32-bit color image. Eight bits each for the red, green and blue components add up to only 24 bits, so the alpha channel completes the 32 bits of information contained in the 32-bit color format. The remaining eight bits are used to store transparency data.

The alpha channel makes it easy for you to place renderings into image and animation compositing applications. This feature is available only if you save the rendering in full-color, 32-bit (*Millions+Alpha*) PICT, Targa, or TIFF format.

SAVING CUSTOM SETTINGS

Select the *Save...* button if you want to save the rendering options you defined so you can recall them later, either in the current project or in another model. The renderer, texture detail, image quality, and the anti-alias filter option are saved as a custom setting.

When you click the *Save* button, the *Save Rendering Settings* dialog appears, prompting you for a name for the new settings.
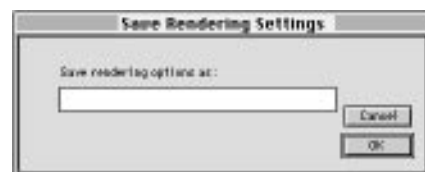
These custom settings will then appear in the list of pre-sets available in the Rendering tool's pop-up menu, as well as in the *Settings* pop-up list in the *Render* dialog.

Deleting Preset Rendering Options

You can delete custom settings from either the *Render* dialog's *Custom Settings* pop-up list or the Render tool's pop-up list. To delete an entry from the *Custom* rendering options list, hold down the Option key while selecting the name of the preset you want to delete. When you release the mouse button, the system will beep to confirm the deletion of that entry from the list. You cannot undo this action.

If you change your mind, you can always add the preset again by manually selecting the same rendering options and saving them to the list.

FRAMES TO RENDER

There are three radio buttons from which to select:

- *Current Frame*
- *All*
- *From*

Only one button can be selected at a time. Click the *Current Frame* button to render a still image. To render an animation, select *All* to render all frames; or select *From,* and then enter the first and last frame to be included in the rendering.

FRAME SIZE

The dimensions of the frame size can be adjusted.

- **Units**. Values for the image size can be specified in pixels, inches, centimeters, or percentage.

- **Size**. You can choose from a set of pre-defined sizes or enter your own custom sizes. Based on the size and resolution settings, the dialog provides feedback on the resolution and how much disk space will be required while the image is being rendered.

  NOTE *The size requirement shown is the absolute minimum; you may need more. You must have at least this much free space, either in RAM or in the virtual memory cache on your hard disk. Depending on the format chosen for saving the image, the saved file may be much smaller.*

  You can also adjust the number of dots per inch or dots per centimeter in the final rendered image. This setting is the resolution of the final image.

  A check box is provided to allow you to constrain the proportions of the frame size.

- **Field Rate**. This feature allows you to render animations that are compatible with video. Most broadcast video is interlaced, with each frame consisting of two fields. Each field contains every other horizontal line in a frame. The first field of horizontal lines is displayed on the screen, and then the second field is displayed, filling in the gaps. Normally, each field is displayed for approximately 1/60th of a second, resulting in a frame rate of 30 frames

per second. However, NTSC standards require precisely 29.97 frames per second.

- **Start with Upper/Lower**. You can begin the rendering with the upper field (first horizontal line) or the lower field (second horizontal line). This setting defaults to *Upper*. These buttons are available only when the *Field Rate* option is enabled.

LIGHT HANDLING

Automatic exposure control is a built-in feature of StudioPro. You can specify the method used for handling lighting overflow during the rendering process.

- **Clipped**. If you select this method, all lighting intensity over 100% is ignored. This is the fastest method of overflow handling. However, it may cause color shifts in the rendered image. The quantity of light falling on a specific area is based on the total of the red, green, and blue components of light. Excess light is clipped as individual components, then recombined, which tends to affect each color component differently. If exact color is critical, clipping the excess light may not be the best solution.

- **Scaled**. This method scales the total lighting intensity down so the highest intensity is equal to 100%. It does not adjust the lighting if no area in the scene exceeds 100%. This method is least likely to cause color shift problems, but takes a bit longer to render.

- **Hybrid**. If the total lighting intensity exceeds 100% in a specific area of the model, the light striking the surface is divided into its specular and diffuse

components. It then scales back the diffuse light based on the value in the *Diffuse %* field (*see below*), and recombines the diffuse and specular components together again. Again, color shifts can occur during the re-mixing process, but this method gives you a greater degree of control.

- **Debug**. If any lighting exceeds 100%, this option shows the overflow areas in the debug color you specify when the scene renders. You can then adjust the lighting components manually to reduce these hot spots. To select the color, click the *Debug* button to display the *Color Picker* dialog.

DIFFUSE %

When the *Hybrid* light handling option is selected, the value in this field is used for scaling the diffuse component of light when the intensity exceeds 100%.

DEBUG COLOR

When the *Debug* light handling option is selected, the color specified here is used to show areas of the rendered model where the lighting intensity exceeds 100%.

INITIATING THE RENDERING

Click *Render* or push the Return key to begin the rendering of the model from the currently active view.

You can choose to set up the rendering now, but not actually begin rendering it until later by clicking the *Suspend* button. All of the modeling data is saved as a self-contained file, and the model won't need to be reopened to restart the rendering.

For more information, *see* **Suspend Rendering** *on page 66.*

When **RENDER** is selected directly from the Rendering menu, the currently active view is used as the viewpoint for the rendering, as well as for size and proportion. The view's focal length setting also becomes the perspective used for the image.

You can also access this dialog by holding down the Shift key while using the Rendering tool to define the dimensions of the rendering. This lets you to crop the scene, as well as letting you access the *Render* dialog. When using the drag-define method with the Rendering tool, the image size in the dialog is adjusted according to the area defined by the drag marquee.

If you try to modify the model while the rendering is in progress, an alert is displayed warning you that the rendering cannot proceed if any changes are made to the model.

Rendering an Image

If the *Current Frame* button is selected, a single image is rendered. This image is rendered and stored internally in full 32-bit color, even if the monitor you're using isn't capable of showing that much color depth. The rendering window displays the

image at the best capability of the monitor. To see the full range of colors contained in a 32-bit color image at the time of rendering, you will need a full color monitor.

For information on saving the image once it's rendered, *see* **Saving Still Images** *on page 12.*

Rendering Animations

When rendering multiple frames, Studio-Pro saves each frame of the animation as soon as it completes rendering. Therefore, if either the *All* or *From* buttons are selected, a dialog is presented allowing you to specify a name and location for saving the animation.
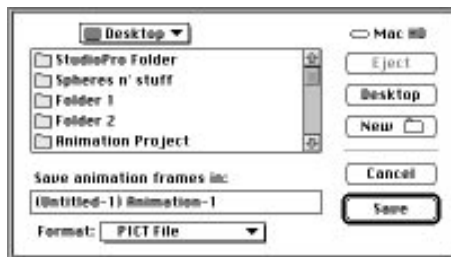
Select a format from the *Format* pop-up menu. You can select to save the frames of the animation in any format available in the *Format* pop-up list. Supported formats include QuickTime movie, and sequentially numbered PICT, Targa, JPEG, and TIFF images.

When you click the *Save* button, the *Compression Settings* dialog is displayed, allowing you to select a compression method and color depth, and set the quality of the

rendering. (*Targa* doesn't require a *Quality* setting; it is always *lossless*.)
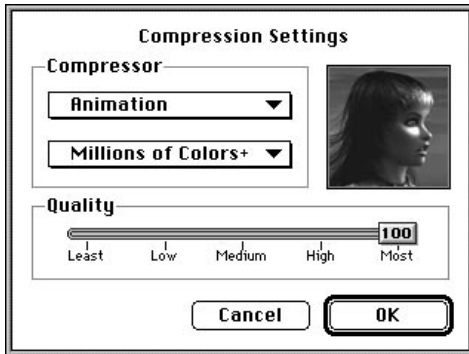
If you select *QuickTime* or *PICT* file formats, the maximum image size is 16KB by 16KB pixels. The maximum pixel size for either *Targa* or *JPEG* is 32KB by 32KB.

The following compressors are available through the QuickTime extension. Others may also be available.

• **Animation**: best suited for images originally created in digital form.

• **Cinepak**: widely used for creating cross-platform, software-only video for distribution on CD-ROM.

• **Component Video** - **YUV**: good intermediate storage format for applying multiple effects to an animation.

• **Graphics**: good picture quality for playback on eight-bit displays.

• **None**: used for acquisition of analog video, as well as digitally-generated animations.

• **Photo** - **JPEG**: produces the highest quality images at the best compression ratios. It is currently not fast enough to

play back animations at acceptable frame rates.

• **Video**: best suited for capture and compression of analog video.

See QuickTime Compression Formats *on page 257* for a description of QuickTime compression methods.

Each frame of the animation is saved as it completes rendering. If you terminate the rendering, the saved animation will be a fully-functional movie file (QuickTime or sequentially-numbered PICT's, Targas, JPEG's, etc.) containing those frames that were rendered and saved up to the point it was stopped.

Rendering in the Background

One of the most powerful features of StudioPro is its ability to render images in the background. The number of images that you can render at the same time is limited only by the available memory. However, rendering in the background splits available CPU time among the renderings in progress and any other activity. The only limitation to rendering in the background is that you can't make any changes to the model during the rendering process.

RENDERING QUEUE

The **RENDERING QUEUE** command lets you add suspended renderings to, or remove them from, the rendering queue. The **RENDERING QUEUE** command is available at all times.

You can add one or more suspended renderings to the job list in the *Rendering Queue* dialog. Only one rendering is active at a time. The order in which you add the jobs to the queue determines the order they are rendered.

When you close a queued rendering, either because it has completed and been saved or it has been terminated by clicking the close box, the next rendering in the queue (if any) loads and begins rendering.

If you quit StudioPro while renderings are in the queue, they are deleted from the queue. The queuing of renderings between sessions is not retained. An alert is displayed informing you that renderings are still present in the queue, and asking if you are sure you want to quit.

If you want to render more than one image at a time, you must open them manually. The rendering queue cannot support multiple renderings at one time. Remember, with more than one rendering in progress at a time, you must send them all to the background so they will share CPU time. Otherwise, the one in the active window takes priority and is given the majority of the CPU time, just like using the rendering queue.

SUSPEND RENDERING

Use the **SUSPEND RENDERING** command to save a rendering in progress. You can then restart it at a later time. The **SUSPEND RENDERING** command is available when a rendering window is the active window, and the rendering is in progress.

When you select this command, the *Suspend Rendering* dialog is displayed.

SUSPENDING SINGLE FRAMES

If you suspend a still image (single frame), the dialog allows you to specify a name, location, and file format for the suspended rendering. The *Collect* check box is unavailable when suspending single frames.

SUSPENDING ANIMATIONS

If you suspend an animation, the name, file format, and location of the file were previously designated at the time the rendering was initiated. The frames were saved as either a self-contained QuickTime movie file or a folder of sequentially num-

bered images as the individual frames completed rendering.

The **SUSPEND RENDERING** command creates a suspension file containing all of the information necessary for continuing the rendering process. The dialog allows you to specify a name and location for the suspension file. This is the file that you need to restart when you're ready to continue rendering. Suspended renderings can also be added to the rendering queue.

Collect existing frames. When this box is unchecked, any frames that have completed rendering remain in the location previously specified.

If this box is checked, all frames of an animation are collected and copied to the same location as the suspension file. The files are renamed with the same name as the suspension file and the file type is appended to the end. The original frames remain in the previous location.

You can specify a new location each time you suspend the rendering. This option allows you to save groups of frames to different volumes, and can be extremely useful when disk space is limited on any one volume.

RESTARTING A SUSPENDED RENDERING

Once you've suspended the rendering, you can use the **OPEN** command in the File menu to restart the suspended rendering, or you can add it to the rendering queue.

You do not need to have the original model open to restart the suspended rendering. The suspension file contains all of the model data necessary to complete the rendering.

You can restart a suspended rendering, let it render for awhile, then suspend it again, as often as necessary to complete the rendering. If you open more than one suspended rendering, you have the option of rendering them all at once, sharing processing time among the windows, or queuing the renderings in sequence.

SUSPEND AND CONTINUE

Use the **SUSPEND AND CONTINUE** command to save your rendering at its current state of completion, then automatically continue with the rendering process. *See* **Suspend Rendering** *on page 66* for complete details.

Once the progress has been saved, the model continues to render. Then, if the rendering is interrupted for some reason, such as a power outage, you won't have to start the rendering process over from the beginning. We suggest you use this command frequently when rendering extremely large or complex models that require a significant amount of time to render.

Windows	
New Window	⌘\
Show Button Bar	
Show Environment Palette	
Show Extension Palette	
Show Object Palette	
Show Project Window	
Show Resource Palette	
Show Statistics Palette	
Show Tool Palette	
Fit Views to All	⌘=
Fit Views to Selection	⌘-
Camera Windows	▶
Spotlight Windows	▶
Images	▶
Untitled-1	

The Windows menu includes commands to control which windows and palettes are displayed on the screen. There are also commands to adjust the proportion and size of the modeling window.

NEW WINDOW

COMMAND \

The **NEW WINDOW** command opens a new window with the same configuration as the active window. This command is useful because it allows you to view your model through another view set center. **NEW WINDOW** is available whenever a document is open.

Once the new window is open, it can be changed. For example, you can add view panes within the window, delete or re-size panes, change the view orientation, or change the display scale.

Each window has an independent view set center. You can move the view set for one window without affecting any other window of the same document. The view set center determines the area of the model space that shows within the views of that window.

SHOW/HIDE BUTTON BAR

This command allows you to show or hide the Button Bar. The command toggles between *Show* and *Hide*, depending on the current status of the Button Bar.

The Button Bar contains buttons for the most often used operations. It also contains buttons that allow you to hide or show any of StudioPro's palettes.

Resource Palette ─── *Environment Palette*
Extension Tool Palette ─── *Tool Palette*
Object Properties Palette ─── *Project Window*
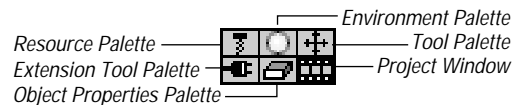
The Button Bar's hide/show status is retained between sessions. If it is hidden when you quit StudioPro, it remains hidden the next time you launch the application. The Button Bar's position on the screen, however, cannot be changed.

SHOW/HIDE ENVIRONMENT PALETTE

The **SHOW ENVIRONMENT PALETTE** command displays the Environment palette. If it is already open, the command changes to **HIDE ENVIRONMENT PALETTE**. Each time you select this command, it toggles between *Hide* and *Show*.
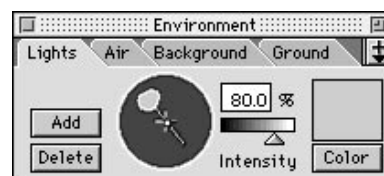
Choosing the **HIDE ENVIRONMENT PALETTE** command is the same as clicking the close box on the Environment Palette.

You can also show or hide this palette by clicking the Environment Palette button on the Button Bar.

Environment Palette

The show/hide status of the Environment Palette is retained between sessions. If it is showing when you quit StudioPro, it will be showing the next time you launch the application.

SHOW/HIDE EXTENSION PALETTE

The **SHOW/HIDE EXTENSION PALETTE** commands allow you to display or hide the Extension Tool Palette, as needed.

This palette can also be shown or hidden by clicking the Extension Tool Palette's hide/show button on the Button Bar.

Extension Tool Palette

Clicking the close box on the Extension Tool Palette is the same as selecting the **HIDE EXTENSION PALETTE** from the Windows menu.

The hide/show status of the Extension Tool Palette is retained from session to session. If the palette is showing when you quit the application, it will be showing the next time you launch StudioPro.

SHOW/HIDE OBJECT PALETTE

The **SHOW OBJECT PALETTE** command displays the Object Properties Palette. This command is available whenever the Object Properties Palette is hidden. **HIDE OBJECT PALETTE** is available when the Object Properties Palette is showing.
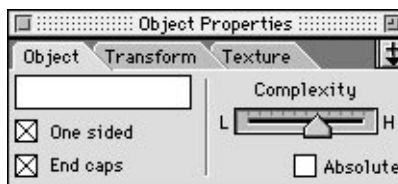
The **HIDE OBJECT PALETTE** command is the same as clicking the close box of the Object Properties Palette or on the Object Properties Palette's show/hide button on the Button Bar.

Object Properties Palette

The hide/show status of the Object Properties Palette is retained from session to session. If the palette is hidden when you quit the application, it will be hidden the next time you launch StudioPro.

SHOW/HIDE PROJECT WINDOW

The **SHOW PROJECT WINDOW** command displays the Project Window. This command is available when the Project Window is hidden. When the Project Window is showing, the command changes to **HIDE PROJECT WINDOW**.

Choosing the **HIDE PROJECT WINDOW** command is the same as clicking the close box on the window or clicking the Project Window's show/hide button on the Button Bar.

 — *Project Window*

Only one Project Window is displayed at a time, even if you have more than one model open. However, when you change the active model, the Project Window redraws to reflect the current model.

If the window was showing when you quit the application after the last session, it will be showing when a model is opened in the current session. If it was hidden when you quit last time, it will be hidden on start up this time. The Project Window's status is retained between sessions.

SHOW/HIDE RESOURCE PALETTE

The **SHOW/HIDE RESOURCE PALETTE** commands toggle as needed to display or hide the Resource Palette.

Choosing the **HIDE RESOURCE PALETTE** command is the same as clicking the close box on the palette or clicking the Resource Palette show/hide button on the Button Bar.

Resource Palette —

If the palette was showing when you quit the StudioPro the last time, it will be showing again when you open a model in the current session. If it was hidden when you quit, it will be hidden on start up this time. The status is retained from session to session.

SHOW/HIDE STATISTICS PALETTE

Select the **SHOW STATISTICS PALETTE** command to display the Statistics Palette. To

close the palette, select **HIDE STATISTICS PALETTE** from the menu.

The Statistics Palette displays important information about the active model. This information includes the number of objects, light sources, spline surfaces, and polygons in either the active view or in the entire model.

SHOW/HIDE TOOL PALETTE

The **SHOW TOOL PALETTE** command displays the Tool palette. **SHOW TOOL PALETTE** is available when the Tool palette is hidden. **HIDE TOOL PALETTE** is available when the Tool palette is showing.

Choosing the **HIDE TOOL PALETTE** command is the same as clicking the close box of the Tool palette or the show/hide button on the Button Bar for the Tool Palette.

— *Tool Palette*

Only one Tool Palette is displayed at a time, even if you have several models open. All open palettes are associated with the active model only.

The Tool Palette's show/hide status is retained from session to session. If the palette is showing when you quit the application, it will be showing the next time you launch StudioPro. If it is hidden

when you quit, it will be hidden on start-up next time.

FIT VIEWS TO ALL

COMMAND =

The **FIT VIEWS TO ALL** command adjusts all views in the active window to include all objects in your model, excluding grids. **FIT VIEWS TO ALL** is available anytime a model is open.

When you select this command, the distance of all views in the active window from their view set center is adjusted and repositioned, if necessary, so the entire model is displayed. The magnification settings are also reset so that all of the objects in the model will appear in all the views. This is useful when you have lost your place in your model.

This command allows you to automatically move to a larger view of the model or shape. The location of the active view set center at the time you select this command determines the extent to which the view must be modified.

Only the views of the active window are affected, unless other windows are also linked to the same view set center. In that case, the views in those windows will also reset to show the entire model.

Modifier keys that apply to FIT VIEWS TO ALL command:

• **Option key** includes all animation paths, as well as all objects. Without the Option key, the view extends to include only the objects in the model.

Determining the extents of all the animation paths of all the objects so they can be included in the views takes longer to calculate. Therefore, this command operates noticeably slower with the Option key held down.

FIT VIEWS TO SELECTION

COMMAND -

Use the **FIT VIEWS TO SELECTION** command when you want to adjust all views in the active window to include only the selected object or set of objects. It does not include any grids which may be associated with the object. **FIT VIEWS TO SELECTION** is available whenever an object is selected.

The command adjusts the distance of all views in the active window from their view set center and, if necessary, repositions the view set center to fit around the selection. The magnification settings are also reset so that any objects you have selected will appear in the views.

This command allows you to automatically move to a tighter view of a specific area within the model or shape. Depending on the location of the view set center at the time you select this command, the affected views may need to be relocated. You can also shift the views and viewing scale manually by using the tools on the Tool Palette.

Only the views in the active window are affected, unless other windows are also linked to the same view set center. In that case, the views in those windows will also redraw to show the selection.

Modifier keys that apply to FIT VIEWS TO SELECTION command:

• **Option key** includes the animation path of the selected object. Without the Option key, this command fits the view(s) only to the selected objects.

Determining the extents of the animation path for the selected object so it can be included in the views takes longer to calculate. This command may operate noticeably slower with the Option key held down.

CAMERA WINDOWS

The **CAMERA WINDOWS** command displays a list of the all camera objects inserted into the model. A camera window is available for each camera object in your model.

This command lets you access camera objects by name through a sub-menu. If you haven't inserted any camera objects in the active model, the **CAMERA WINDOWS** command is dimmed.

When you select one of the camera objects in the list, that camera's window becomes the active window. You can also open a camera window by double-clicking on the camera object directly in the modeling window.

A check mark appears in front of the camera window's name when it's the active window. To make another camera window the active window, select that camera's window from the list. A check mark appears in front of its name in the menu.

Camera windows are a special type of window. Each one contains a view of the model from the position of the camera object. It is not attached to any view set, as are the views in modeling windows. Camera objects (and their windows) are free to move anywhere and have any orientation in the model.

SPOTLIGHT WINDOWS

The **SPOTLIGHT WINDOW** command displays a list of all the spotlights that are present in the active model. Each spotlight has its own spotlight window.

Spotlight windows make it possible for you to "see" exactly where the spotlight is illuminating the model. This window also provides controls that help you aim the spotlight in the modeling window.

When you select a spotlight from the list, the window associated with that spotlight opens and becomes the active window.

You can also open a spotlight window by double-clicking on the spotlight icon in the modeling window.

When a spotlight window becomes active, a check appears in front of the spotlight window's name.

If no spotlights are present in the active model, this command is dimmed and unavailable.

IMAGES

The **IMAGES** command displays a submenu listing all open rendering, snapshot, and animation windows. This command is available when one or more of these windows are open. If none are open, the command is dimmed.

When a rendering, image, or animation window is the active window, a check mark appears in front of the window's name. To make another window the active window, select that window from the list. A check mark appears in front of its name in the menu.

You can also select to show all open rendering, image, or animation windows. Selecting **SHOW ALL** brings all of these windows forward, in front of the modeling window.

2

PALETTES &
WINDOWS

View Move tool	Object Move tool
View Rotate tool	Object Rotate tool
View Zoom tool	Object Scale tool
Lathe tool	Extrude tool
Sphere tool	Cube tool
Cone tool	Rounded Cube tool
Cylinder tool	Pyramid tool
Text tool	Bézier Pen tool
Rectangle tool	Oval tool
Rounded Rectangle tool	Regular Polygon tool
Point Light tool	Spotlight tool
Camera Object tool	Grid tool
Link tool	Unlink tool
Rendering tool	
	Rendering Settings pop-up menu
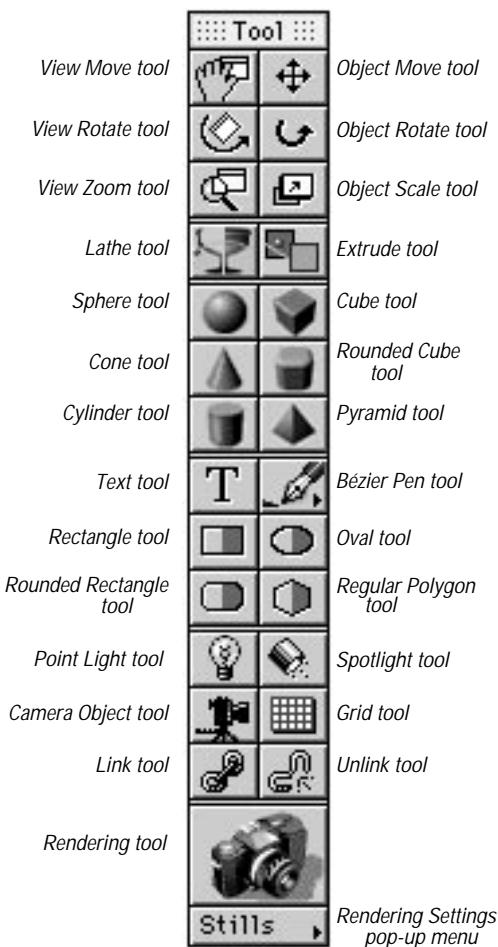
The Tool Palette contains tools to create and manipulate the objects in your models. When a tool is selected, its icon becomes highlighted and appears inverted on the Tool Palette. Only one tool can be active, or selected, at a time.

The Tool Palette is a floating palette. You can move it around the screen and position it wherever you want. This palette floats above all model windows and is always available for selecting tools. To move the palette, just drag it by its title bar.

To hide the Tool Palette, select the **HIDE TOOL PALETTE** command in the Palettes sub-menu of the Windows menu, or click the Tool Palette's hide/show button on the Button Bar.

Show/Hide Tool Palette

To show the Tool Palette, select **SHOW TOOL PALETTE** from the Palettes sub-menu in the Windows menu, or click the Tool Palette's show/hide button on the Button Bar.

Each time StudioPro is launched, all of the palettes are positioned just as they were when you quit the last time. If a palette was hidden when you last quit, it remains hidden when the application is launched the next time.

The tools are arranged on the palette according to their function. The following categories of tools appear on the Tool Palette:

• View Management tools

• Object Manipulation tools

• Specialized Modeling tools

• 3-D Primitive tools

• 2-D Drawing tools

• Construction tools

• Rendering tools

Many of the tools on the Tool Palette have an associated *Tool Settings* dialog that allows you to change the default behavior of the specific tool. To access this dialog, double-click the tool on the Tool Palette. If the tool has no tool settings, a dialog appears telling you that there are no settings for this tool.

There are times during the modeling process when you would like more precision as you create, edit, or position the objects in your model. Therefore, you can change any tool's cursor to a cross-hair cursor at any time by turning Caps Lock on.

VIEW MANAGEMENT TOOLS

The view management tools allow you to control how your model appears in the modeling window. These tools do not affect the objects in any way; they only change how the objects are viewed.

View Move tool

View Rotate tool

View Zoom tool

These tools are located in the upper left section of the tool palette. This grouping consists of the View Move tool, the View Rotate tool, and the View Zoom tool.

Each view can be rotated or moved independently, but all views remain linked to the view set center at all times.

VIEW MOVE TOOL

The View Move tool is also referred to as the Grabber or Scrolling tool. It lets you scroll a model in the window. Only the view moves; not the objects themselves.

TOOL FUNCTION

When the View Move tool is selected, an overlay appears in the modeling window. This overlay contains specialized handles which allow you to change the view plane. Each view can be moved independently, but all views remain linked to the view set center at all times.
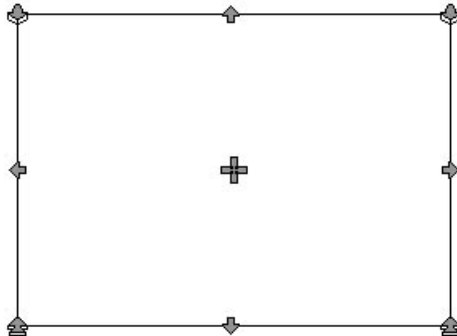
Numeric feedback appears below the button bar, showing the actual distance moved from the view center. When you release the mouse button, a new view center is calculated.

When the View Move tool is selected, the cursor changes to a "grabber" cursor.

View Move cursor

Corner handles move view planes on the depth axis. The bottom corner handles move the view plane closer; the top corner handles move the view farther away. However, if the perspective selector is set at the *Orthographic* position, the effect of the move is not apparent. You may want to change the perspective setting or the view so you can more accurately move the view.

Edge handles constrain the movement of the view horizontally or vertically, as indicated by the arrows.

Free move by grabbing anywhere in the view except on a handle. This moves the view in an unconstrained manner in any direction, including diagonally.

Sometimes the views don't appear to be moving at all. This is usually because one or more of the following conditions exist:

- There is no perspective in the view.

- The view plane is very close to the view set center.

- The view plane is very far away.

If this occurs, back up slightly to make sure the entire object is visible on the front side of the viewing plane.

Modifier keys that apply to the View Move tool:

- **Shift key** constrains the scrolling direction while using the "Grabber" method to either the vertical or horizontal axis.

VIEW ROTATE TOOL

This tool rotates views around the view set center. Only the view rotates; the objects are not affected in any way.

Any view can be rotated independently, but it always remains linked to the view set center.

TOOL FUNCTION

When the View Rotate tool is selected, an overlay appears on the active view. This overlay contains handles to rotate the view around the model on any axis. The overlay is visible in all views of the active window.
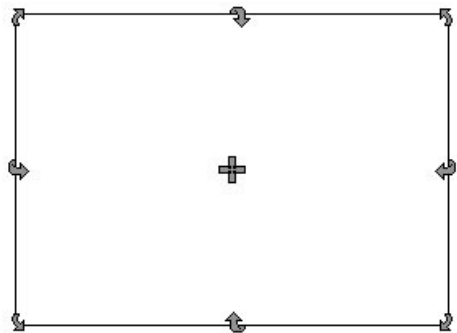
The view set center determines the center of rotation for rotating views in that window. Use the appropriate handle to adjust the view on one axis at a time. Numeric feedback is provided showing the degrees of rotation relative to the previous location.

When the View Rotate tool is selected, the cursor changes to a "grabber" cursor.

 View Rotate cursor

Corner handles rotate the view plane clockwise or counter-clockwise, as indicated by the arrows, around the view set center.

Edge handles rotate the view plane around the view set center. The rotation is constrained horizontally or vertically in the direction indicated by the arrows.

Free rotate by grabbing anywhere other than a handle. The view rotates freely in any direction around the view set center.

Modifier keys that apply to rotating views:

- **Shift key** constrains the view rotation on the chosen axis to 45° increments.

- **Option key** allows you to rotate the view in less than one degree increments.

VIEW ZOOM TOOL

 The View Zoom tool is used to magnify or reduce the size of the image in a particular view. The magnification can be adjusted to control how much of the model is visible at one time.

TOOL SETTINGS

To access the *Tool Settings* dialog, double-click on the View Zoom tool.
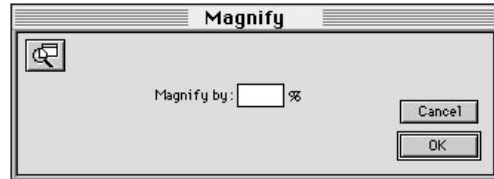
You can specify the percentage by which the view is enlarged or reduced with each click in the window.

TOOL FUNCTION

Magnifying (or reducing) an image does not change the actual size of the objects. It only changes the apparent size in the view.

The View Zoom tool operates in two ways:

- **Click to zoom**. Each click in the active view magnifies or reduces the image by the percentage specified in the *Tool Settings* dialog. The default mode is set to magnify, and this is indicated by a plus symbol in the cursor. To reduce the view, hold down the Option key while clicking. Note that with the Option key held down, the symbol in the cursor changes to a minus symbol.

 Plus symbol to magnify view

 Hold Option key down to reduce the view

The single click method also moves the view set center. When magnifying, the view zooms in on the point where the cursor is clicked, and the location of the view set center also changes to that area of the model.

When using the Option key in conjunction with the View Zoom tool to reduce the view, the position you click in the modeling window becomes the new view set center.

•   **Drag to zoom**. Position the cursor in the view and click-and-drag to define the area to be magnified. The area of the model you define with this method will enlarge to fill the entire active view. Use this method to adjust the magnification according to the amount the cursor is dragged.

There is a limit on how much you can magnify or reduce a view, depending on your computer's ability to display the objects accurately. If you try to go beyond the limit, an alert appears and the system beep sounds.

To achieve the desired view without going beyond these limits, try one of the following methods:

•   Move the view plane closer to (or farther from) the objects in the view with the View Move tool.

Or, you can first use the **FIT VIEWS TO ALL** or **FIT VIEWS TO SELECTION** commands in the Windows menu to globally adjust the position of the view distance and view scale in one step.

•   Try increasing (or decreasing) the focal length of the view using the perspective control at the top of the window. However, it has limited range and may not be sufficient for your needs.

•   Increase (or decrease) the scale of the objects. You should use this approach only as the last resort to solve view display and rendering problems. Some situations may require this adjustment in order for the software to function at its best.

Modifier keys that apply to magnifying views:

•   **Option key** reduces the image with the single-click method.

OBJECT MANIPULATION TOOLS

The object manipulation tools are located in the top right corner of the tool palette. Use these tools to select or manipulate objects.

Object Move tool

Object Rotate tool

Object Scale tool

Any of the object manipulation tools can be used as selection tools. In addition to selecting objects with these tools, each one also has a separate function.

SELECTING OBJECTS

You can select an object with any of the object manipulation tools (Move, Rotate, Scale). Simply click on the surface of the object.

You can also change the rules that Studio-Pro uses when selecting objects. To change the selection rules, use the **MOUSE FILTER** command in the Selection Menu. *See* Mouse Filter *on page 27* for more information on changing these rules.

More than one object can be selected at a time using either of the following methods:

• **Hold down the Shift key while clicking on additional objects.** If an object is already selected, that object becomes deselected without affecting any of the other objects.

 If you click on overlapping objects, only the object in front is selected. You can also use a view from another direction to access hidden objects.

• **Drag a selection marquee around the item or items to select them**. Normally, an item is selected only when completely enclosed within the marquee. However, by holding down the Command key, all items touched by the selection marquee are also selected.

To deselect all objects, click anywhere in the view away from any objects. You may also use the **SELECT NONE** command in the Selection menu.

If you hold down the Control key when selecting an object, a list appears that

includes all of the objects that reside along the depth axis at the position you click.
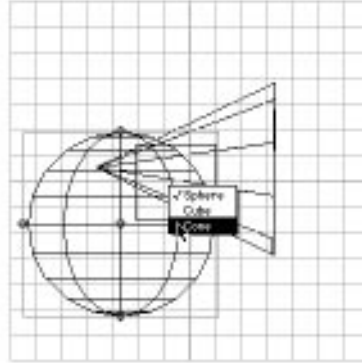
A check appears beside objects that are currently selected. If you hold down the shift key as well, you can select multiple items. If you select an item from the list that is already selected, it becomes deselected.

You can delete the selected object(s) from your model by pressing the Delete key or selecting the **DELETE** command from the Edit menu.

Double-Clicking on an Object

If you double-click on an object, a separate window opens displaying only that object. If the object is a group, the group opens in its own window. If the object is a shape instance, its shape window opens. If the shape contains other shape instances, double-clicking on a shape within a shape window opens that shape in its own window, and so on.

If you double-click on an object that is an editable entity, you can then select the **RESHAPE** command and edit the object in

its own window, rather than in the modeling window.

If the object has a texture or effect applied to it, you can position the texture or effect in its own window by selecting the **EDIT PLACEMENT** command.

Modifier keys that apply to selecting objects with the Object Move, Rotate, or Scale tools:

- **Shift key** extends the selection of objects. Without the Shift key, you can only select one object at a time. With the shift key held down, if you select an object that is already selected, it becomes deselected.

- **Command key** selects all objects that are within or touching a selection marquee. Without the Command key, only the objects that are completely within the marquee are selected.

- **Control key** displays a list of all objects found along the depth axis at the position the cursor is clicked. You can select or deselect objects from this list.

OBJECT MOVE TOOL

⊕ The Object Move tool moves selected objects in the active view. This tool also functions as a pointer or selection tool.

TOOL FUNCTION

When the Object Move tool is selected, the cursor changes its appearance. If the

Caps Lock key is on, the cross-hair cursor appears.

▶ *Object Move cursor*

⌖ *with Caps Lock key on*

You can toggle from any tool on the Tool Palette to any of the object manipulation tools (Move, Rotate, Scale) by simply pressing the Space bar. Then, tapping the Space bar again returns to the previous tool.

The Object Move tool can also be selected at any time by simply pressing "1" on the keyboard.

To move an object, click-and-drag on the surface or drag the object with the selection handles.

When the Object Move tool is selected, handles appear on each face of the selected object. When the display method is set to *Front*, the face handles may appear similar to edge handles.

Front view   *Isometric view*

However, if you change the view plane slightly, the location of the handles becomes apparent.

Face handle constrains the movement perpendicular to the plane of the selected handle.

Free move by grabbing anywhere on the surface other than on a handle. Using this method, the object can be moved anywhere on the active grid, but it can't be moved away from the grid.

If more than one object is selected, multiple bounding boxes appear and move in unison.

Moving the object perpendicular to the active grid can be accomplished in different ways:

• If the object has never been rotated, you can grab the face handle on the plane parallel to the active grid. This is easiest to accomplish in the *Isometric* view orientation. (An object always moves relative to itself, but if it's never been rotated, the object's coordinates are aligned to the grid.)

• Group the object. The **GROUP** command can be used with single objects as well as multiple objects. When you group an object, a new set of coordinates is established for the group, with its new coordinates aligned to the active grid. Therefore, once the object is grouped, you can grab the handle parallel to the active grid to move the object away from (perpendicular to) the grid. After you've moved the object, you can then ungroup it if you want to restore its previous coordinates. When you ungroup the object, its previous coordinates are re-established.

• Move the object on the *Transform* tab of the Object Properties Palette. You can

specify to move the object relative to the active grid.

Move relative to:
○ Object   ○ World   ◉ Grid

You can easily change grids at any time, even in the middle of a move operation, by pressing the Plus (+) or Minus (-) keys to cycle through all of the world and user-defined grids in the active model.

This tool can also be used to move camera objects and light sources; however, these objects do not have handles. Just grab the camera or light source to move it. To move a camera or light source perpendicular to the active grid, use the Command + Shift keys.

You can also nudge objects with the arrow keys. The distance nudged is determined by the nudge subdivisions indicated in the *Set Units* dialog. Nudging always occurs relative to the active grid. The arrow keys are used to nudge the selected object in following directions:

Keystroke	*Direction moved* (relative to selected coordinate system)
Up-Arrow	Positive Y direction
Down-Arrow	Negative Y direction
Right-Arrow	Positive X direction
Left-Arrow	Negative X direction
Command-Up-Arrow	Positive Z direction
Command-Down-Arrow	Negative Z direction

Modifier keys that apply to moving objects with the Object Move tool:

• **Shift key** constrains the motion to 45-degree increments on the active grid or on a plane parallel to the active grid.

• **Command key** moves the object origin point without moving the object itself; or, if you grab the object rather than the origin point, moves the object, but not the origin point. Without the Command key, the object and the origin point move together.

   To move the object's origin point on the depth axis, you must change the orientation of the view to reveal the grid on which you want to move the origin point.

• **Option key** leaves a copy of the object in the original position.

NOTE *You should note that ALL modeling occurs on the active grid. Therefore, if the active grid appears edge-on, or nearly edge-on, you may want to switch to a different grid. Also, be cautious when moving objects in a NEARLY edge-on orientation to the active grid. When moving objects in this orientation, what appears to be a very short distance may actually be an extremely long distance. You may want to change the view orientation before moving objects to achieve more predictable results.*

OBJECT ROTATE TOOL

The Object Rotate tool rotates objects in the active view. This tool can also be used for selecting objects.

TOOL FUNCTION

When you select the Object Rotate tool, the cursor changes its appearance.

Object Rotate cursor

with Caps Lock key on

You can toggle from any tool on the Tool Palette to any of the object manipulation tools (Move, Rotate, Scale) by simply pressing the Space bar. Tapping the Space bar again returns you to the previous tool.

The Object Rotate tool can also be selected at any time by simply pressing "2" on the keyboard.

When you select an object, handles appear on each edge of the bounding box. Objects can be rotated either by click-and-dragging on the surface or by rotating them with the edge handles. By using the handles, you have additional constraints and control not otherwise available.

Edge handle constrains the rotation of each face clockwise or counter-clockwise around the object's origin point. You can rotate the object on all three axes.

Front view   *Isometric view*

The location of the object origin point determines the axis of rotation. The object origin point is the diamond that appears with the selection handles on an object.

Normally, this point is at the geometric center of the object, but you can move it, if desired. *See* **Re-center** *on page 44* for more information on object origin points and their use.

If multiple objects are selected, each object rotates around its own origin point.

Free rotate by grabbing anywhere on the surface of the object. The object rotates around the object's origin point in an unconstrained manner. Rotation can be in any direction. If multiple objects are selected, each object rotates around its own origin point.

If you want to rotate the object freely around its geometric center instead of its origin point, you can do so by grouping the object. (Select the object and select the **GROUP** command. This command can be used with single objects as well as multiple objects.) When you group an object, a new set of coordinates is established for the group, with the initial position of the origin point at its geometric center. Therefore, once the object is grouped, you can freely rotate it around its origin point (now at its geometric center) and then ungroup it after you rotated it. When you ungroup the object, its previous coordinates are re-established, including the previous position of the origin point.

The Shift key does NOT constrain the rotation direction while freely rotating.

Modifier keys that apply to rotating objects:

• **Command key** drags the origin point without moving the object itself. Without the Command key, the object moves with the origin point.

To move the object's origin point on the depth axis, you must change the orientation of the view to reveal the grid on which you want to move the origin point.

• **Option key** leaves a copy of the object in its original position.

• **Shift key** constrains the rotation to 45˚ increments. The Shift key constrains ONLY when rotating objects by dragging the handles. When rotating by grabbing the surface of the object, the Shift key does not constrain the motion.

OBJECT SCALE TOOL

The scale tool is used to resize or stretch objects. You can also use this tool to select objects.

TOOL FUNCTION

When you select the Scale tool from the Tool Palette, the cursor changes its appearance.

Object Scale cursor

with Caps Lock key on

You can toggle from any tool on the Tool Palette to any of the object manipulation tools (Move, Rotate, Scale) by simply pressing the Space bar.

The Object Scale tool can also be selected at any time by simply pressing "3" on the keyboard.

Scaling an object allows you to enlarge or reduce it in a single dimension (height,

width, or depth) or on all three axes at once. Objects are scaled in the direction the cursor is dragged.

When you select an object, handles appear on each face and corner of the object's bounding box. The handles modify the behavior of the scale operation:

Front view   Isometric view
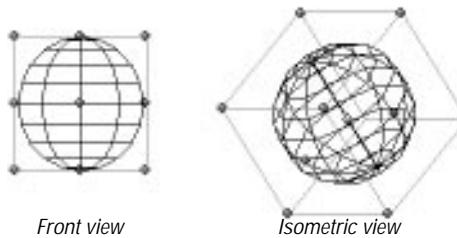
Face handle constrains the scale perpendicular to the face. The handle can be pushed or pulled along one axis only. If it's pushed beyond the original position, the object inverts and continues to scale.

Corner handle scales in a plane parallel to the active grid. As with the center handle, if the corner handle is pushed beyond the original position, the object inverts and continues to scale.

Free scale by grabbing anywhere other than a handle. The object scales proportionally in all three directions.

Modifier keys that apply to scaling objects with the Object Scale tool:

• **Command key** keeps the origin point stationary while scaling in the direction the cursor is dragged. Without the Command key, the origin point maintains its position relative to the scale.

• **Command key** (if the origin point is selected instead of the object) moves

the origin point without moving the object. Without the Command key, the object moves with the origin point.

To move the object's origin point on the depth axis, you must change the orientation of the view to reveal the grid on which you want to move the origin point.

• **Option key** scales an object from its geometric center.

• **Shift key** maintains the proportions of the object while enlarging or reducing its size. The object scales on all three axes according to the path you drag.

• **Option**+**Shift keys** scale an object proportionally from the object's geometric center.

SPECIALIZED MODELING TOOLS

This section of the Tool Palette allows you to create lathed and extruded objects directly in the modeling window.

Lathe tool Extrude tool

LATHE TOOL

Use the Lathe tool to create 3-D objects by revolving 2-D objects through space.

TOOL SETTINGS

The *Tool Settings* dialog allows you to change the default behavior of the Lathe

tool. To access the *Tool Settings*, simply double-click the Lathe tool.
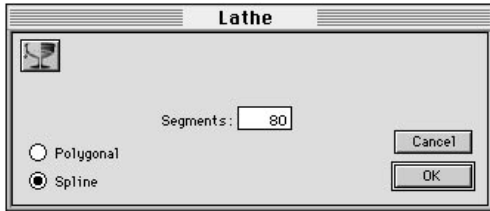
- **Segments**. This field determines the default number of segments used in each 360° revolution. The greater the number of segments, the smoother the final object appears.

- **Polygonal, Spline**. You can choose to create either a polygonal or Bézier object with the Lathe tool.

TOOL FUNCTION

You can use any single 2-D object or 2-D group as a template. If the template is a closed line, it can be filled or unfilled.

The Lathe tool can be used to select a 2-D template. If an object is already selected, you can use the tool to select a different 2-D object or group, if desired.

A message appears if the object you select is not suitable for use as a template, and the system beep sounds.

If a filled 2-D object is lathed less than 360 degrees, it appears as a solid object with endcaps. If you perform the same lathe

operation on an unfilled 2-D object, it appears hollow with no endcaps.

180° lathe with filled 2-D template

180° lathe with unfilled 2-D template

Select a handle on the bounding box to revolve around the object. The opposite extent of the bounding box becomes the initial axis of rotation for the lathe operation.

Select this handle...
This point becomes anchored in space.

An axis appears opposite the handle you select
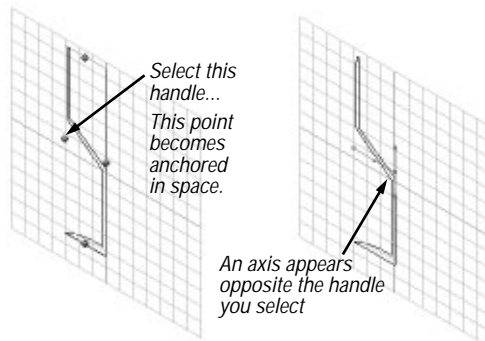
The location of the handle you grab becomes a beginning point for the lathe operation, and cannot be moved. This is especially important when choosing to perform a sweep operation.

Grab the handle and rotate the profile to define the total number of degrees. Rotations of more than 360 degrees are not

apparent unless the axis is shifted, as when performing a sweep motion.

360 degree lathe *180 degree lathe*
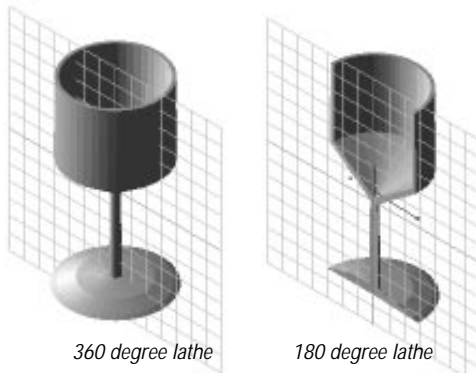
When you release the handle, the lathe process completes. The object origin point is placed in the geometric center of the resulting lathed object.

EDITING LATHE OBJECTS

To edit the template of the selected lathed object, select the **RESHAPE** command from the Modeling menu or click the **RESHAPE** button on the Button Bar. You can edit the template directly in the modeling window.

To edit the template in its own window, double-click on the lathe object to display it in its own window. Then, from this window, select the **RESHAPE** command in the Modeling menu.

To push or pull individual vertices on the final 3-D lathed object, you must first convert it to another object type. *See* **Convert on page 42** for complete details about this command.

To change any of the original lathe parameters of the lathe operation, select the lathe object and Lathe tool. You can

then edit the object in several different ways.

To tilt the axis, grab an end handle on the axis and push or pull it to the desired position.

End handle
Center handle
End handle
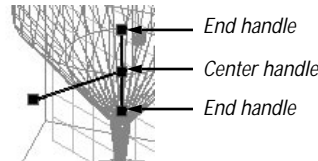
Grab the center handle on the axis to move it in or out.

To perform a sweep, hold down the Shift key, then grab the center handle on the axis and move it up or down.

Template rotated four times around its axis.   *With Shift key down, grab center handle and pull upward.*
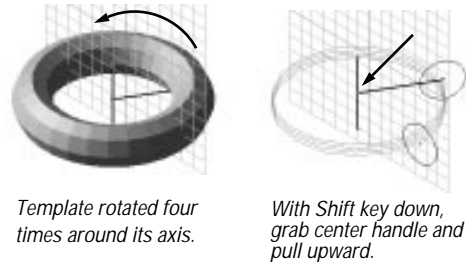
Rotations greater than 360 degrees are apparent with sweep operations.

Pull to desired height   *Release mouse button*
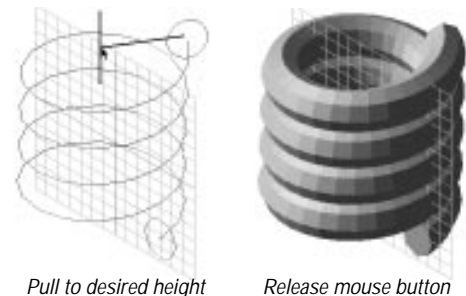
If the axis becomes hidden within the Sweep object and you need to access it for

further editing, you may need to change the display method to *Wireframe* or *Point Cloud.*

To temporarily display the position of an axis that's hidden within the object, place the cursor on the object and hold down the mouse button. Then, when you release the mouse button, the object redraws, but it will be easier to "guess" the position of the axis and center handle so you can grab it.

Object Properties Palette

You can also edit the Lathe object from the *Object* tab of the Object Properties Palette.
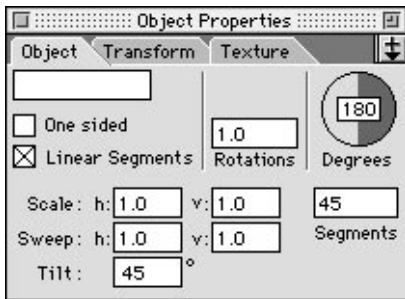
- **Name**. If the selected object has been named, its name appears in this field. You can edit the existing name at any time.

- **One sided**. This check box indicates whether the object is one-sided or two-sided. You can convert it from one type to another by checking or unchecking this box.

  Single-sided surfaces are only visible to the rendering algorithms from one side; double-sided objects are visible from either side.

If you are planning to apply a transparent texture with refractive properties, or a volumetric effect such as mist or fog, you'll need to create a solid, one-sided object.

Transparent objects with single-sided surfaces refract light coming through them as if the objects were solid, such as a solid crystal ball. Objects with double-sided surfaces appear hollow, like a hollow shell, and cannot refract light.
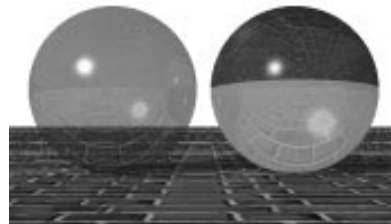
Two-sided   *One-sided*

- **Linear segments.** When this box is checked, the areas between segments contain flat surfaces, creating a ridge-like appearance. The greater the number of segments, the smoother the surface appears. When this box is unchecked, the areas between segments create a smoothly curved surface.

Linear Segments option enabled   *Linear Segments option disabled*

- **Rotations**. This field keeps track of the total number of rotations. Each time the axis is rotated more than 360°, the number in this field increases by one.

- **Degrees**. This value indicates the degrees of rotation used to create the lathed object. Enter any number in the numeric input field or specify the value interactively with the control provided.

With the cursor, grab the control here...

then drag and rotate to indicate the total number of degrees of rotation desired
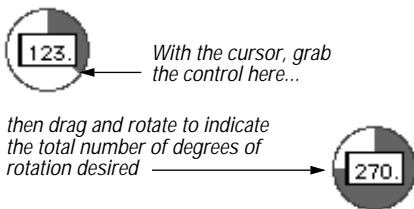
If greater than 360 degrees, however, the effect is not visible unless you move the horizontal or vertical axis to any value other than one. This is equivalent to a sweep operation.

- **Scale**. This value indicates the percentage of the height and width of the template by which EACH segment is scaled, relative to the previous segment.

- **Sweep**. The value in the horizontal field controls the perpendicular distance from the axis that each segment moves, relative to the previous segment. The value in the vertical field determines the distance each segment moves ALONG the axis, relative to the previous segment.

- **Tilt**. This value represents the number of degrees that the axis of rotation is titled relative to its original orientation.

- **Segments**. This field indicates the number of segments the lathed object has. The higher the value in this field, the smoother the surface of the object appears.

For more information about the **Object Properties Palette**, *see page 197.*

EXTRUDE TOOL

 The Extrude tool allows you to create 3-D objects from 2-D templates.

TOOL SETTINGS

Double-click the Extrude tool to display the *Extrude Tool Settings* dialog. From this dialog, you can change the default behavior of the Extrude tool.

The *Tool Settings* dialog lets you select a profile to use as a bevel for the Extrude operation. The default profile is a square profile, but a variety of profiles are available to choose from.

- **Router or Scaled bevel**. There are two different ways to extrude objects: *Router* and *Scaled.* The method chosen

determines how the extrusion bevel is applied to the template.

Router-type extrusions: Scale-type extrusions:

• **Profile**. Use the arrows to scroll through the pre-defined bevels available.

• **Hole extrusion method**. You can choose one of three ways to extrude any holes in the object: *Normal, Inverted,* and *None.*

No bevel in holes   *Normal bevel in holes*   *Inverted bevel in holes*
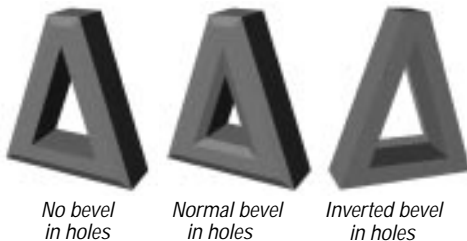
The inverted bevel is apparent when viewed from behind.

These settings determine the default behavior of the tool. You can always edit the extrude object from the Object Properties Palette after it's been created. For details, *see page 93.*

TOOL FUNCTION

Select any 2-D object, or 2-D group, to use as a template for the Extrude operation.

Once selected, a 2-D bounding box with a single handle in the center appears around the object.

If an object isn't suitable for extruding, you can't select it with the Extrude tool.

To extrude the object, grab anywhere on the face and pull or push. The extrusion always occurs in a direction perpendicular to the face of the template. If the face is pushed beyond the original position, it inverts and continues to extrude.

EDITING EXTRUDED OBJECTS

You can edit the face and the bevel of the selected Extrude object by using the **RESHAPE** command from the Modeling menu. Only the template and the bevel appear.
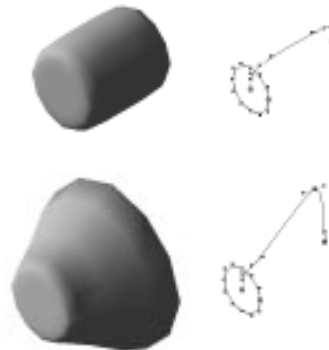
You can edit the bevel of an extruded object to radically change its appearance. By changing the bevel at different points in time, you can create an animation in which the object changes shape before your eyes.

You can manipulate the vertices to edit either the template or the bevel directly in the modeling window.

To **RESHAPE** the extruded object in its own window, double-click on it; then select the **RESHAPE** command from the Modeling menu. The extruded object opens in its own window. *See* **Reshape** *on page 31* for more information on this command.

To change the depth of the extrusion, select the extruded object with the Extrude tool.

Select object   *Grab handle, then push or pull to*
with Extrude tool   *change the depth of the extrusion*
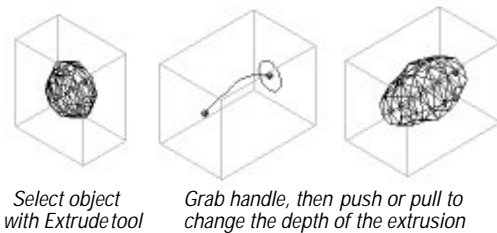
Object Properties Palette

An Extrude object can also be edited on the *Object* tab of the Object Properties Palette.
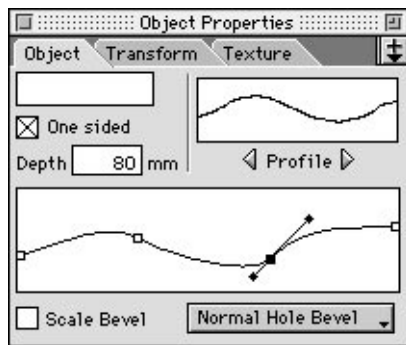
- **Name**. You can assign a name to this object, if desired.

- **One sided**. When this box is checked, the object is a solid, one-sided object.

When no check appears, the object is a two-sided object. You can convert it from one type to another by checking or unchecking this box.

If you are planning to apply a transparent texture with refractive properties, or a volumetric effect such as mist or fog, you'll need to create a solid, single-sided object.

Single-sided surfaces are only visible to the rendering algorithms from one side; double-sided objects are visible from either side.

- **Depth**. This field indicates the current depth of the object.

- **Profile**. This area contains a preview of the current bevel. You can change the bevel by using the arrows to scroll through the pre-defined profiles.

An edit window is provided to edit the profile that appears in the preview area. When you click in the edit window, the tool palette changes to provide tools for editing the profile. You can reposition, add, or delete points with these tools. *See* **Reshape** *on page 31* for complete instructions on using these tools. When you're finished editing the profile, click anywhere outside the editing window. The preview updates.

- **Scale Bevel check box**. When a check appears in this box, the *Scale Bevel* option is enabled. If the box is not checked, the *Router Bevel* is used instead.

- **Hole extrusion method**: This field contains the current hole bevel option: *None, Normal,* or *Inverted.*

For a description of the other tabs, *see* **Object Properties Palette** *on page 197.*

PRIMITIVES TOOLS (3-D OBJECTS)

This section of the tool palette contains tools that draw 3-D primitives. Of all object types, primitives take the least amount of memory and render the fastest. You should use primitives whenever possible.

Sphere tool	● ◆	*Cube tool*
Cone tool	▲ ⬛	*Rounded Cube tool*
Cylinder tool	⬛ ◆	*Pyramid tool*
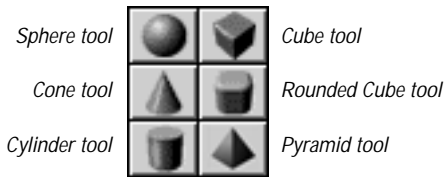
Drawing Primitives

You can draw primitive objects in two ways:

• **Three-step method**. The size of the primitive's bounding box is defined by three separate mouse clicks.

Click#1
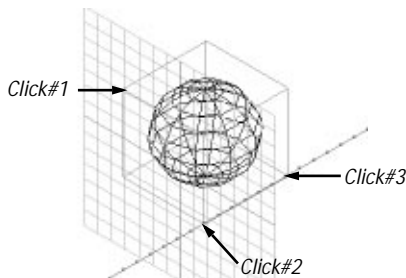
Click#3

Click#2

The first two clicks must be on the active grid. After the second click, a temporary grid line appears as an aid for positioning the third click. This is easiest to accomplish when working in isometric view. If you're working in *Front - Orthographic* view, for example, you won't be able to see where to position the third click. However, you can change the view orientation before positioning the third click.

• **Click-and-drag method**. Again, the first two points must be defined on the active grid.

Click-and-drag from here

to here
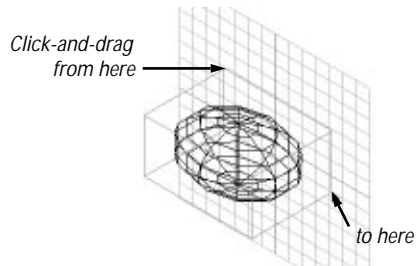
StudioPro determines the location of the third point by adding the first two dimensions together, and dividing the sum by two.

Modifier keys that apply to drawing 3-D objects with the click-and-drag method:

• **Shift key** constrains the tools to draw objects with the same dimensions on all axes.

• **Option key** draws an object from its center, instead of the corner.

• **Option + Shift keys** draw objects from the center with equal proportions in all dimensions.

SPHERE TOOL

Use this tool to draw spherical-shaped objects.

TOOL SETTINGS

Double-click the Sphere tool to display the *Tool Settings* dialog.

- **One sided**. This check box indicates whether the object is one-sided or two-sided. You can convert it from one type to another by checking or unchecking this box.

  If you are planning to apply a transparent texture with refractive properties, or a volumetric effect such as fog or mist, be sure to check the *One-sided* check box.

TOOL FUNCTION

For instructions on drawing a sphere, *see* **Drawing Primitives** *on page 94.*

You can change from the pointer cursor to the cross-hair cursor by turning on Caps Lock.

Pointer cursor

Cross-hair cursor

Object Properties Palette

After you've inserted a sphere into your model, you can modify it by modifying the values on the *Object* tab of the Object Properties Palette.
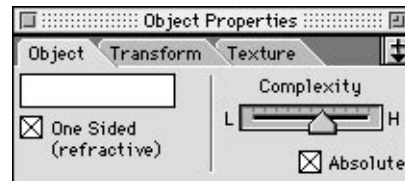
- **Name**. This field contains the name of the selected sphere, if one has been assigned. You can edit the name at any time.

- **One Sided**. A check mark in this box indicates the selected sphere is a solid, one-sided sphere. If no check appears in this box, the selected sphere is a hollow, two-sided sphere. You can change the sphere from solid to hollow, or vice versa, at any time.

- **Complexity slider**. The position of this slider determines the complexity, or amount of detail, with which the sphere is rendered, either in the modeling window or in the final image. It does NOT change the actual complexity of the sphere, but only the way the renderers display it.

- **Absolute check box** - When this box is *unchecked*, the slider indicates a relative complexity based on the maximum allowed by that renderer. The range of complexity is also affected by the size of the sphere and its proximity to the view plane. For example, if the sphere appears at a substantial distance in the

background, a lesser complexity level will be used.

When this box is *checked*, the *Complexity Slider* indicates the EXACT percentage of the maximum complexity allowed.

For complete details on the other tabs, *see* **Object Properties Palette** *on page 197.*

CUBE TOOL

Use this tool to draw cube-type shapes in the active view.

TOOL SETTINGS

Double-click the Cube tool to display the *Tool Settings* dialog.
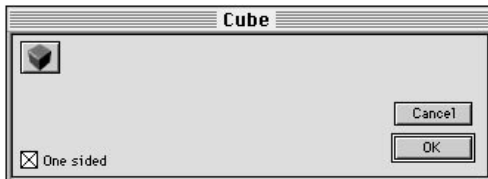
• **One sided**. This check box indicates whether the cubes created with this tool will be one-sided or two-sided. Single-sided surfaces are only visible to the rendering algorithms from one side; double-sided objects are visible from either side.

If you are planning to apply a volumetric effect such as fog or mist, or a transparent texture with refractive properties, you'll need to create a solid, single-sided cube.

TOOL FUNCTION

For instructions on drawing a cube, *see* **Drawing Primitives** *on page 94.*

You can change from the pointer cursor to the cross-hair cursor by turning on Caps Lock. This cursor provides more accurate control when inserting objects into your model.

Pointer cursor

Cross-hair cursor

Object Properties Palette

Once you've inserted a cube into your model, you can modify it on the *Object* tab of the Object Properties Palette.
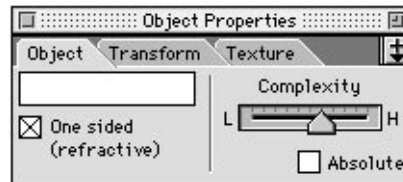
• **Name**. This field contains the name of the selected cube, if a name has been assigned. You can assign a name at any time, or edit the existing name.

• **One sided**. You can change the cube from a solid, one-sided cube to a hollow, two-sided cube, or vice versa, at any time.

• **Complexity slider**. The position of this slider determines the complexity, or amount of detail, with which the cube is rendered, either in the modeling window or in the final image. It does NOT change the actual complexity of

the cube, but only the way the render-ers display it.

• **Absolute check box** - When this box is *unchecked*, the slider indicates a relative complexity based on the maximum allowed by that renderer. The range of complexity is also affected by the size of the cube and its proximity to the view plane.

When this box is *checked*, the *Complexity Slider* indicates the EXACT percentage of the maximum complexity allowed.

For details on the other tabs, *see* **Object Properties Palette** *on page 197*.

CONE TOOL

 Use this tool to draw cone-shaped objects.

TOOL SETTINGS

You can change the default settings for the tool by double-clicking the Cone tool icon on the Tool Palette. The *Tool Settings* dialog appears.
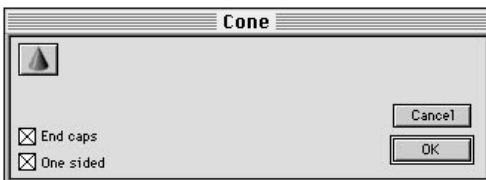
• **Endcaps**. This check box determines whether or not the cones created with this tool have endcaps. You can create a cone with no endcap(s) or a closed

cone, depending on the settings for the tool.

• **One sided**. When this box is checked, cones created with this tool will be solid, one-sided objects. Objects must be created as *One-Sided* to have refractive properties, or when you want to apply volumetric effects, such as mist, to them. If no check appears in this box, cones will be created as two-sided. If a transparent texture is applied to a double-sided cone, it appears as a hollow enclosed object, and does not refract light passing through it.

> **NOTE** *If you remove the endcaps from a solid, one-sided object, that object appears invisible when viewed from the inside. Therefore, if you want to create a hollow cone, remove the check from both the* One-Sided *and the* Endcaps *check boxes.*

TOOL FUNCTION

Cones are always drawn with the base placed flat on the active grid, and the top of the cone pointing in a direction perpendicular to the active grid.

You can change from the pointer cursor to the cross-hair cursor by turning on Caps Lock.

 Pointer cursor

 Cross-hair cursor

When you draw a cone using the click-and-drag method, you can specify the height or width of the cone. If you change the proportions of the cone, the base is also distorted from a perfect circle.

For instructions on drawing a cone, *see* **Drawing Primitives** *on page 94.*

Object Properties Palette

Once you've inserted the cone into your model, you can edit it by changing the values on the *Object* tab of the Object Properties Palette.
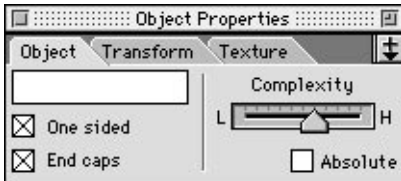
- **Name**. This field contains the name of the selected cone. To assign a name to the cone, enter a name in this field. The name can be edited at any time.

- **One sided**. When this box is checked, the selected cone is a solid, one-sided object. If no check appears in this box, the selected cone is two-sided.

- **Endcaps**. This check box indicates whether or not the selected cone has endcaps.

- **Complexity slider**. The position of this slider determines the complexity, or amount of detail, with which the cone is rendered, either in the modeling window or in the final image. It does NOT change the actual complexity of the cone, but only the way the renderers display it.

- **Absolute check box** - When this box is *unchecked*, the *Complexity Slider* indicates a relative complexity based on the maximum allowed by that renderer.

The range of complexity is also affected by the size of the cone and its proximity to the view plane.

When this box is *checked*, the *Complexity Slider* indicates the EXACT percentage of the maximum complexity allowed.

For instructions on using the other tabs on this palette, *see* **Object Properties Palette** *on page 197*.

ROUNDED CUBE TOOL

Use this tool to draw cube-type shapes with rounded corners.

TOOL SETTINGS

Double-click the Rounded Cube tool to access its *Tool Settings* dialog.
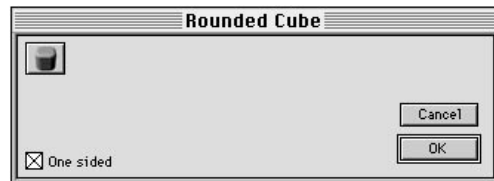
- **One sided**. This check box indicates whether cubes created with this tool are one-sided or two-sided.

Single-sided surfaces are only visible to the rendering algorithms from one side; double-sided objects are visible from either side. If you are planning to apply a transparent texture with refractive properties, or a volumetric shader such as mist, you'll need to create a solid, single-sided object.

TOOL FUNCTION

The radius of the rounded corners is fixed. Like the standard cube, this object is a single entity and cannot be ungrouped.

The cursor can be changed from a pointer cursor to a cross-hair cursor by turning on Caps Lock.

▶ *Pointer cursor*

-¦- *Cross-hair cursor*

For instructions on drawing a rounded cube, *see* **Drawing Primitives** *on page 94.*

Object Properties Palette

Once drawn, the rounded cube can be edited on the Object Properties Palette.
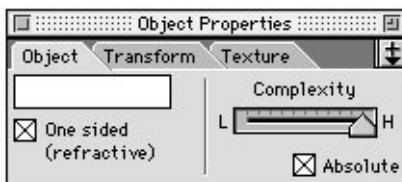
- **Name**. This field contains the name of the selected object, if one has been assigned. You can enter a name in this field, or edit an existing name at any time.

- **One sided**. This check box specifies whether the selected cube is one-sided or two-sided. You can convert it from one type to another by checking or unchecking this box.

- **Complexity**. The position of this slider indicates the current complexity set-

ting, or amount of detail, with which the cube is rendered, either in the modeling window or in the final image. It does NOT change the actual complexity of the cube, but only the way the renderers display it.

- **Absolute check box** - When this box is *unchecked*, the slider indicates a relative complexity based on the maximum allowed by that renderer. The range of complexity is also affected by the size of the cube and its proximity to the view plane.

  When this box is *checked*, the slider indicates the EXACT percentage of the maximum complexity allowed by each renderer.

For complete details on the other tabs found on this palette, *see* **Object Properties Palette** *on page 197.*

CYLINDER TOOL

Use this tool to draw cylindrical-shaped objects.

TOOL SETTINGS

You can change the default behavior of the Cylinder tool through the *Tool Settings* dialog. To access this dialog, double-click the Cylinder tool icon on the Tool Palette.
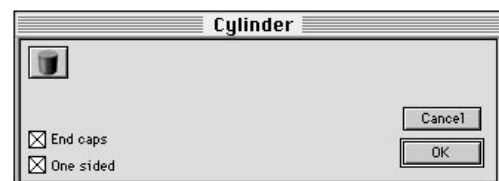
• **Endcaps**. This check box determines whether or not the cylinders created with this tool have endcaps. You can create a cylinder with no endcap(s) or a closed cylinder, depending on the settings for the tool.

• **One sided**. When this box is checked, cylinders created with this tool will be solid, one-sided cylinders. Objects must be created as *One-Sided* to have refractive properties. If you want to apply volumetric effects, such as mist or fog, to a cylinder, it must also be created as a one-sided object. If no check appears in this box, cylinders will be created as two-sided objects.

TOOL FUNCTION

Cylinders are always drawn with the base placed flat on the active grid. The curved surface of the cylinder is smoothed when rendered.

You can change from the pointer cursor to the cross-hair cursor by turning on Caps Lock.

Pointer cursor

Cross-hair cursor

For instructions on drawing a cylinder, *see* **Drawing Primitives** *on page 94*.

You can create a hollow cylinder or a closed cylinder with endcaps, depending on the settings for the tool.

Object Properties Palette

Once you've created a cylinder, you can edit it from the *Object* tab of the Object Properties Palette.
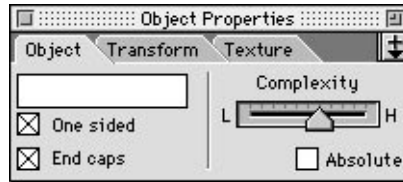
• **Name**. If this cylinder has been named, the name appears in this field. You can add a name, or edit an existing one, at any time.

• **One sided**. When this box is checked, the selected cylinder is a solid, one-sided object. If you want the cylinder to have refractive properties, or you plan on applying a volumetric effect to the cylinder, it must be created as *One sided.* If no check appears in this box, the selected cylinder is two-sided. When a transparent texture is applied, the cylinder appears hollow, and does not refract light passing through it.

• **Endcaps**. This field indicates whether or not the cylinder has endcaps. You can remove or add endcaps by changing the status of this check box.

NOTE *If you remove the endcaps from a solid, one-sided object, that object appears invisible when viewed from the inside. Therefore, if you want to create a hollow cylinder, or tube, remove the check from both the* One-sided *and the* Endcaps *check boxes.*

- **Complexity slider**. The position of this slider determines the complexity, or amount of detail, with which the cylinder is rendered, either in the modeling window or in the final image. It does NOT change the actual complexity of the cylinder, but only the way the renderers display it.

- **Absolute check box** - When this box is *unchecked*, the slider indicates a relative complexity based on the maximum allowed by that renderer. The range of complexity is also affected by the size of the cylinder and its proximity to the view plane.

  When this box is *checked*, the slider indicates the EXACT percentage of the maximum complexity allowed.

See **Object Properties Palette** *on page 197* for information about the other tabs on the Object Properties Palette.

PYRAMID TOOL

This tool allows you to draw pyramid-shaped objects.

TOOL SETTINGS

Double-click the Pyramid tool to display the *Tool Settings* dialog.

- **One sided**. This box indicates whether the pyramids you create are solid, one-sided objects or hollow, two-sided objects.

  If you are planning to apply a transparent texture with refraction, or a volumetric effect such as fog or mist, the pyramid must be created as a one-sided object.

TOOL FUNCTION

You can change from the pointer cursor to the cross-hair cursor by turning on Caps Lock.

Pointer cursor

Cross-hair cursor
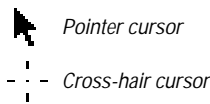
See **Drawing Primitives** *on page 94* for detailed instructions on drawing pyramids.

Object Properties Palette

Once created, the pyramid can be modified on the *Object* tab of the Object Properties Palette.
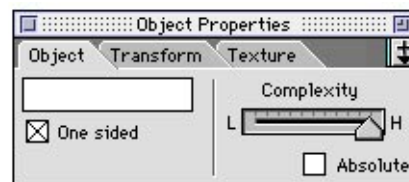
- **Name**. If the selected pyramid has been named, the name appears in this field. You can add a name, or edit an existing one, at any time.

• **One sided**. When this box is checked, the selected pyramid is a solid, one-sided object. If you want the pyramid to have refractive properties, or if you plan on applying a volumetric effect such as fog or mist, it must be created as *One sided*. If no check appears in this box, the selected pyramid is two-sided and will appear hollow if a transparent texture is applied.

• **Complexity slider**. The position of this slider determines the complexity, or amount of detail, with which the pyramid is rendered, either in the modeling window or in the final image. It does NOT change the actual complexity of the pyramid, but only the way the renderers display it.

• **Absolute check box** - When this box is *unchecked*, the slider indicates a relative complexity based on the maximum allowed by that renderer. The range of complexity is also affected by the size of the pyramid and its proximity to the view plane.

When this box is *checked*, the slider indicates the EXACT percentage of the maximum complexity allowed.

DRAWING TOOLS (2-D OBJECTS)

The drawing tools are used to draw two-dimensional objects. These objects have height and width, but no depth. The 2-D drawing tools include the Text tool, Bézier Pen tool, and the Rectangle, Oval,

Rounded-Rectangle, and Regular Polygon tools.
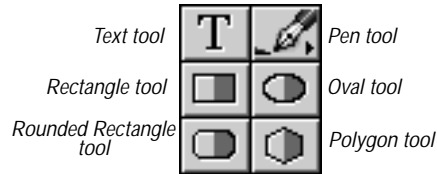
Typically, they serve as templates for the Lathe and Extrude tools, but may also be left as two-dimensional objects.

The size and proportion of the object are determined by the starting and ending position of the cursor on the grid as it is dragged.

The Rectangle, Oval, Rounded Rectangle, and the Polygon tools all have a filled and unfilled representation showing on the Tool palette. You can select the filled version by clicking the right side of the tool or the frame version by clicking the left side. A filled object renders with a surface, while the unfilled, frame-only version renders hollow.

Modifier keys that apply to drawing 2-D objects (except the Text tool):

• **Shift key** constrains the tools to draw equally-proportioned objects, (squares, circles, etc.). With the Pen tool, the Shift key constrains line segments to 45° increments.

• **Option key** draws an object from its center, instead of the corner. The Option key does not apply to the Pen or Text tools.

- **Option** + **Shift keys** draw equally pro-
  portioned objects from the center.

TEXT TOOL

Use this tool to enter text into a
model. The cursor changes to an
I-beam when the Text tool is
selected.

TOOL FUNCTION

When you click in the modeling window,
a dialog appears for specifying the neces-
sary settings. If you want to specify the
location and size of the text *before* its cre-
ated, click-and-drag the cursor vertically
in the active view. Then, when you release
the mouse button, the *Text* dialog appears.
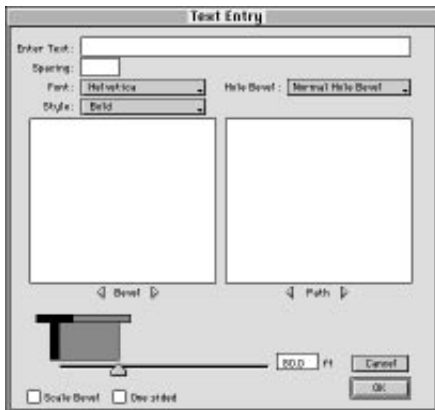
This dialog contains the following set-
tings:

- **Text**. Enter a single line of text in this
  field. This line can contain up to 255
  characters. However, because you are

limited to a single line, the *Return* char-
acter is not a valid character.

- **Spacing**. Set the default letter spacing
  in this field. A value of zero is the
  normal letter spacing for the chosen
  font. Letter spacing is an index value
  that is proportional to the font being
  used. The higher the value, the wider
  the characters are spaced apart. Nega-
  tive values will condense letters.

- **Font**. You can use any font present in
  your system. StudioPro supports both
  ATM™ and TrueType™ fonts, but will
  use the TrueType form if both forms are
  present in your System folder. For best
  results, you should choose fonts that
  have font-smoothing data present.

  Simple bitmap fonts are not recom-
  mended. Bitmapped fonts appear with
  jagged edges. Smoothed fonts appear
  refined and give a very good represen-
  tation.

- **Style**. Choose a style for the text. You
  can choose *Regular, Italics,* or *Bold.*

- **Hole Bevel**. You can choose one of
  three ways to extrude any holes in the
  text: *Normal, Inverted,* and *None.*

No bevel   Normal bevel   Inverted bevel
in holes   in holes   in holes
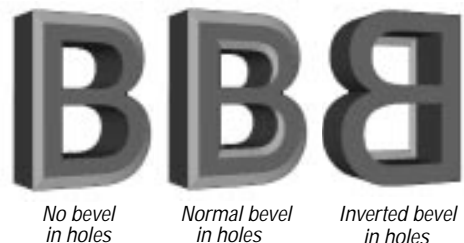
The inverted bevel is apparent when viewed from behind.

- **Bevel**. Use the arrows to scroll through the preset bevels available. Select a profile to use as a bevel for the text. The default bevel is a square profile.

  If you don't find the exact extrusion settings you want, StudioPro allows you to modify one of the pre-defined bevels to meet your specifications.

  To customize an extrusion, first choose one from the pre-defined settings that is closest to the results you want to achieve. Then, to customize the bevel, adjust the individual vertex points along the spline path that describes the bevel.

  The bevel is a side profile. It is always an open line with the left end point corresponding to the front face of the text and the right end point corresponding to the back face.

  You can move vertex points within the window and adjust their direction handles to bend the line as needed to create the desired bevel.

  To add a vertex point, hold down the Option key while placing the cursor on the line between two other points When the cursor changes to a plus symbol (+) as it intersects the line, click the mouse button. You can add a vertex point and begin dragging it immediately.

  To hinge a vertex point, hold down the Option key while dragging one of the direction handles. You will be able to drag it without the opposite handle moving. Once you break the continuity of the direction handles for a particular point, you can move either handle

freely without using the Option key again.

To re-align direction handles that were previously hinged, move one of the handles until it is visually aligned with the handle on the other side, causing the handles to link together.

To delete a vertex point, select the point and press the Delete key. You cannot delete all of the vertices; there must always be at least two vertices, the minimum number required to define a straight line (the simplest bevel possible).

- **Path**. Select the path on which to align the text. Some of the preset path choices appear below:

concave   *convex*

diagonal down   *wave*
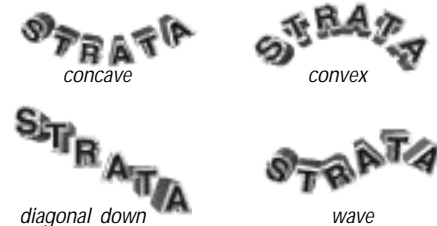
- **Extrude Depth**. Use the slider or enter a value in the numeric entry field to specify a depth for the extrusion. If you want to create 2-D text, enter an extrusion depth of zero.

- **Scale bevel**. You can choose from two different ways to extrude text: *Router* and *Scale*. The method chosen determines how the extrusion bevel is applied to the template. If this box is

not checked, the *Router*-type extrusion is applied.

Router-type extrusions:

and spacing you specified for those fields.

When you click the *OK* button, the characters are extracted in the shape of the selected font, and then extruded into 3-D objects.

EDITING TEXT

Scale-type extrusions:

To edit text after it's been created, select the text and then select the Text tool. This action displays the *Text* dialog and lets you re-create the text with different settings.

Object Properties Palette

Once created, the text can also be edited from the *Object* tab of the Object Properties Palette.

- **One sided**. This check box indicates whether the text is one-sided or two-sided. You can convert it from one type to another by checking or unchecking this box.

  If you are planning to apply a transparent texture with refractive properties, or a volumetric shader such as fog or mist, you'll need to create the text as solid, single-sided objects.

  Transparent objects with single-sided surfaces refract light coming through them as if the objects were solid, such as a solid crystal ball. Objects with double-sided surfaces appear hollow, like a hollow shell, and cannot refract light.

- **Kerning.** In addition to the *Spacing* field, you can achieve even more subtle spacing between your characters. Place the cursor between two letters, hold down the Option key, and use the left and right arrow keys to kern.

  As you enter text into the text field, the text appears according to the font, style,

- **Name**. You can name the text object, if desired. This field contains the name of the selected text object. You can edit the name at any time.

- **Font**. This field contains the current font. You can change the font by select-

ing a different one from the pop-up menu. All fonts present in the system are listed.

- **Text**. You can edit the text in this field.

- **Depth**. This field determines the depth of the extrusion. A value of zero in this field indicates a 2-D object.

- **Bevel**. Editing the bevel on the Object Properties Palette is the same as editing the bevel in the *Text* dialog. All of the same commands for editing the bevel apply here, as well. For details, *see page 104*.

- **Path**. This field specifies the path on which the text is oriented. You can change the path by selecting a different one from those available.

- **Scale Bevel**. When this box is checked, a scale-type bevel is applied; otherwise, a router-type bevel is used.

- **Hole Bevel Type**. You can choose one of three ways in which to extrude the holes in text: *Normal bevel in holes*, *Inverted bevel in holes*, or *No bevel in holes.*

For information on editing the other tabs, *see page 197*.

PEN TOOL

The Bézier Pen tool can be used to draw Bézier lines or Bézier regions.

BÉZIER LINES

Select this tool from the Pen tool pop-out to draw Bézier curves or lines. Lines drawn with this tool can reside on more than one plane. You can change planes while you're drawing the line.

Tool Settings

Double-click on the Pen tool to display the *Tool Settings* dialog.
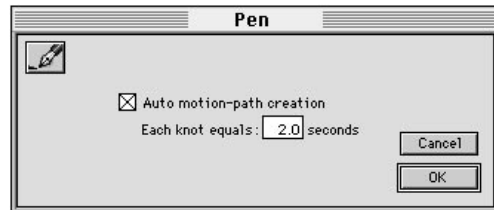
- **Auto motion-path**. Check this box to create a animation path rather than a 2-D line. Even with the box checked, however, this option applies ONLY when the first click of the mouse button is on another object. If the first click is on an object, that object will highlight, verifying that the click did occur on an object, and the line you draw will become an animation path, not a 2-D line. If the object does not highlight, the line you create is a 2-D line, not an animation path.

Each click of the mouse button, as the animation path is drawn, inserts a anchor point. The time interval between anchor points is also specified in this dialog.

If this option is checked, but the first click is NOT on another object, the line

you draw does not become an anima-
tion path, but just a 2-D line.

BÉZIER REGIONS

 Select this tool from the Pen tool
pop-out to draw Bézier regions.
By default, objects drawn with
this tool are filled; however, you can
change the object to an unfilled status on
the Object Properties Palette.
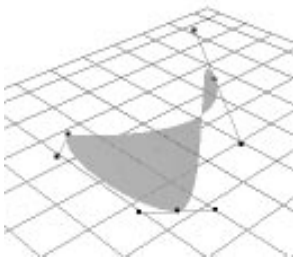
TOOL FUNCTION

Both Pen tools function in a similar man-
ner. However, you can change grids at any
time and continue drawing the line on a
different grid when using the Bézier Line
Pen tool. When using the Bézier Region
Pen tool, the entire region must reside on a
single plane. You cannot change grids
while drawing an object with the Bézier
Region Pen tool.

You can change from the pointer cursor to
the cross-hair cursor by turning on Caps
Lock.

 Pointer cursor

 Cross-hair cursor

All of the lines drawn with either of the
Pen tools must be drawn on the active
grid.

Simply click anywhere in the modeling
window to define the starting position of a
straight line segment.

Click-and-drag to define the starting posi-
tion of a **curved line segment**. The direc-
tion the control handle is dragged
determines the direction of the curve. The
length of each control handle determines
the height or depth of the curve.

Continue to click or click-and-drag to
create the line.

To complete the line, double-click or
press the Return key. Clicking on the first
point closes the line.

To remove the last line segment, press the
Delete key at any time during the drawing
process. To remove more than one seg-
ment, continue to press the Delete key
until as many line segments have been
deleted as desired.

Try to use as few anchor points as possi-
ble. Don't place them too close together
unless necessary. The more anchor points
there are, the more memory required.

To draw perpendicular to the active grid,
hold down the Command + Shift keys.
This option is available only with the
Bézier Line Pen tool. A temporary grid

line appears to assist you in accurately positioning the next anchor point.

Temporary grid

Temporary grid intersects active grid at this point.
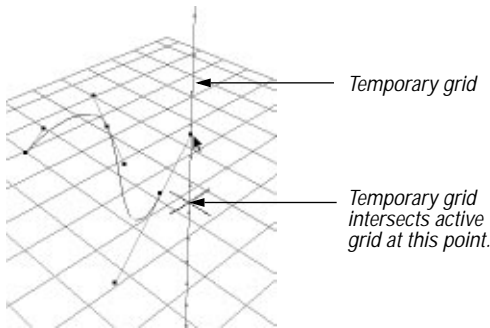
To create a hinged anchor point, hold down the Option key and click to define the position of the anchor point to be hinged, then drag in the direction of the curve.
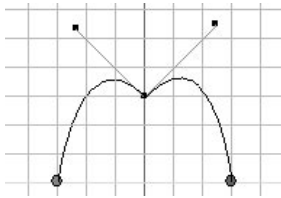
To re-align previously hinged anchor points, grab one of the handles and visually align it with the opposite handle. When properly aligned, the handles lock in position.

To add a straight line segment to a Bézier curve, click on the last anchor point, and then click again where you want the straight line segment to end.
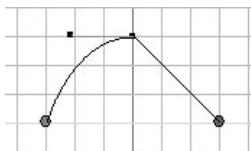
To collapse the handles, drag the handle to overlap the vertex point, then release the mouse button.

Modifier keys that apply to the Pen tool:

• **Shift key** constrains drawing or dragging to 45 degree increments.

• **Option key** breaks continuity on Bézier handles, creating a sharp corner or hinged joint.

EDITING LINES

To edit the selected line directly in the modeling window, choose the **RE-SHAPE** command from the Modeling menu.

To edit the line in a separate window, double-click on the line. This places the selected line in its own window. From this window, select the **RESHAPE** command. This allows you to reshape the line from this window instead of reshaping it in the modeling window.

See **Reshape** *on page 31* for more information on using this command.

You can also use the **CONVERT** command from the Modeling menu to convert a region to a line, or vice versa. *See* **Convert** *on page 42* for more information.

Object Properties Palette

The Object tabs of the Object Properties Palette are similar for the two types of Pen tools. Bézier regions, however, can be

converted from filled to unfilled, and vice versa.

Pen tool - Bézier Line

```
┌──────────────────────────────────────┐
│ ▢ ::::::::::::: Object Properties ::::::::::::: ▣ │
├──────────────────────────────────────┤
│ Object ⟍ Transform ⟍ Texture ⟍      ╪ │
│ ┌──────────────┐                      │
│ │ Curve 1      │                      │
│ └──────────────┘                      │
│                                       │
│                                       │
└──────────────────────────────────────┘
```

Pen tool - Bézier Region

```
┌──────────────────────────────────────┐
│ ▢ ::::::::::::: Object Properties ::::::::::::: ▣ │
├──────────────────────────────────────┤
│ Object ⟍ Transform ⟍ Texture ⟍      ╪ │
│ ┌──────────────┐                      │
│ │ Region 1     │                      │
│ └──────────────┘                      │
│ ⊠ Filled                              │
└──────────────────────────────────────┘
```
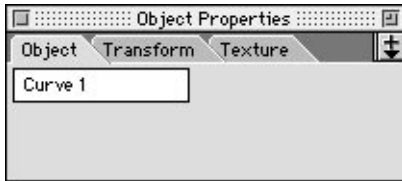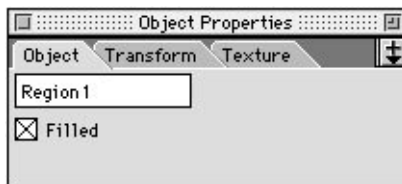
For complete information on the Object Properties Palette, *see page 197*.

RECTANGLE TOOL

Use this tool to draw rectangular-shaped objects. The Rectangle tool has no tool settings.

TOOL FUNCTION

You can change from the pointer cursor to the cross-hair cursor by turning on Caps Lock.

▶ *Pointer cursor*

‐ ¦ ‐ *Cross-hair cursor*

You can draw squares or rectangles of any proportions. These objects always have square corners.

The size of the rectangle is determined by the starting and ending position of the cursor as you drag it on the active grid. Or, click at the starting point and at the ending point to define its size.

The rectangle can be either filled or hollow, depending on which side of the rectangle tool icon is selected.

Unfilled rectangle ────── [icon] ────── *Filled rectangle*
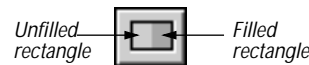
**Modifier keys that apply to drawing rectangles:**

• **Shift key** constrains the tool to draw squares.

• **Option key** draws a rectangle from its center, instead of the corner.

• **Option** + **Shift keys** draw a square from its center.

Object Properties Palette

You can assign a name or change the existing name of the selected rectangle on the *Object* tab of the Object Properties Palette. The *Filled* check box indicates whether or not the object is filled or unfilled. You can change its *filled* status at any time.

```
┌──────────────────────────────────────┐
│ ▢ ::::::::::::: Object Properties ::::::::::::: ▣ │
├──────────────────────────────────────┤
│ Object ⟍ Transform ⟍ Texture ⟍      ╪ │
│ ┌──────────────┐                      │
│ │              │                      │
│ └──────────────┘                      │
│ ⊠ Filled                              │
└──────────────────────────────────────┘
```
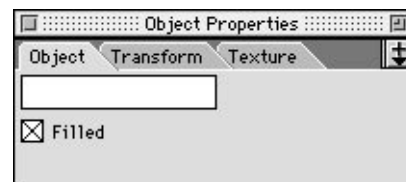
For information on the other tabs found on this palette, *see page 199.*

OVAL TOOL

Use this tool to draw oval-shaped objects.

TOOL SETTINGS

Double-click the Oval tool to display the *Tool Settings* dialog.
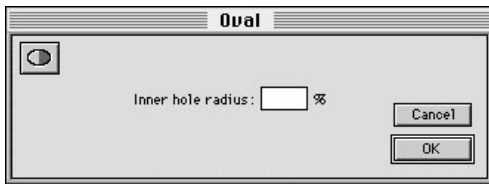
• **Inner hole radius**. You can create a hole in the center of the oval by entering a value in this field. This value specifies the percentage of the outer radius to remove from the center of the oval. If this value is zero, or if the oval is unfilled, no hole is created.

TOOL FUNCTION

The Oval tool can draw exact circles or ovals of any proportion.

You can change from the pointer cursor to the cross-hair cursor by turning on Caps Lock.

Pointer cursor

Cross-hair cursor

The size of the oval is determined by the starting and ending position of the cursor as you drag it on the active grid. You can also draw an oval by clicking at the start-

ing point and at the ending point to define its size.

The oval you draw can be either filled or hollow, depending upon which side of the oval tool icon you clicked.

Unfilled oval — Filled oval
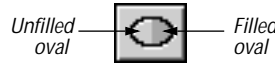
Modifier keys that apply to drawing ovals:

• **Shift key** constrains the tool to draw circles.
• **Option key** draws an oval from its center, instead of the corner.
• **Option + Shift keys** draw a circle from its center.

Object Properties Palette

Once the oval is drawn, you can modify it on the Object Properties palette.
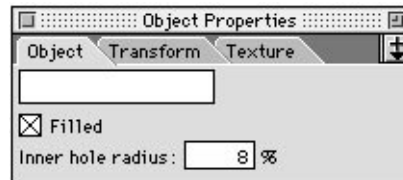
• **Name**. This field contains the name of the selected oval, if one has been assigned. You can add a name or change the existing name at any time.

• **Filled**. When this box is checked, the oval is filled. You can change its status between filled and unfilled at any time.

• **Inner hole radius**. This field indicates the current size of the hole in the center of the oval. You can change its size by

entering a different value in this field. The value in this field indicates the percentage of the oval to remove from the center.

For information on the other tabs on the Object Properties Palette, *see page 197*.

ROUNDED RECTANGLE TOOL

Use this tool to draw rectangles with rounded corners.

TOOL SETTINGS

You can change the radius of the corners on the rectangle in the *Tool Settings* dialog. Double-click on the Rounded Rectangle tool to access this dialog.
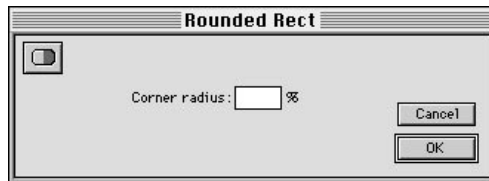
- **Corner radius**. This setting determines the roundness of the corners. The value entered is a percentage of the smaller dimension of the rectangle.
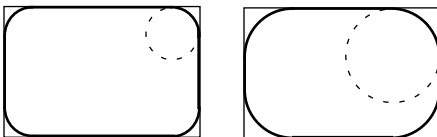
The size of the circle determines the way in which the corners are rounded. The smaller the circle, the less rounded the corners appear. Larger circles create more rounded corners.

TOOL FUNCTION

The radius of the corners is determined by the setting specified in the *Tool Settings* dialog.

You can change from the pointer cursor to the cross-hair cursor by turning on Caps Lock.

Pointer cursor

Cross-hair cursor

The size of the rounded rectangle is determined by the starting and ending position of the cursor as you drag it on the active grid. You can also draw a rounded rectangle by clicking at the starting and ending points to define its size.

The rectangle can be either filled or unfilled, depending on which side of the Rounded Rectangle tool icon you clicked.

Unfilled rounded rectangle — *Filled rounded rectangle*
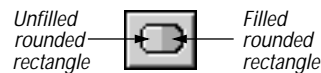
Modifier keys that apply to drawing rounded rectangles:

- **Shift key** constrains the tool to draw squares.

- **Option key** draws a rectangle from its center, instead of the corner.

- **Option + Shift keys** draw a rounded-corner square from its center.

EDITING ROUNDED RECTANGLES

Once the rounded rectangle is drawn, you can change the roundness of the corners

on the *Object* tab of the Object Properties palette.
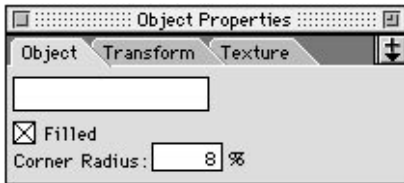
You can also add or change the name, or change the filled/unfilled status of the rounded rectangle. *See page 197* for information on the other tabs on the Object Properties Palette.

POLYGON TOOL

Use this tool to draw 2-D shapes polygons with a pre-determined number of equilateral sides.

TOOL SETTINGS

To change the default behavior of this tool, double-click the Polygon tool on the Tool Palette to display the *Tool Settings* dialog.
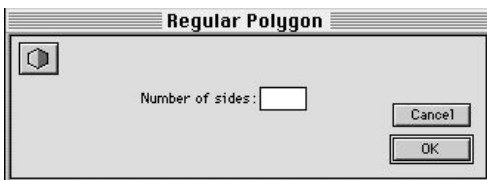
- **Number of sides**. The number in this field determines the number of sides the polygon will have.

TOOL FUNCTION

The size of the polygon is determined by the starting and ending position of the

cursor as you drag it on the active grid. You can also define the size of the polygon by clicking at the starting point and at the ending point.

The polygon you draw can be either filled or hollow, depending on which side of the rectangle tool icon you selected.

Unfilled polygon — Filled polygon

Modifier keys that apply to drawing polygons:

- **Shift key** maintains the proportions of the polygon. All sides are equilateral.

- **Option key** draws a polygon from its center, instead of the corner, and maintains the proportions. In addition, you can rotate the polygon to position it in any orientation you want before releasing the mouse button.

- **Option** + **Shift keys** draw an equilateral polygon from its center.

EDITING POLYGONS

Once the polygon is drawn, you can change the number of sides the polygon contains on the *Object* tab of the Object Properties palette.
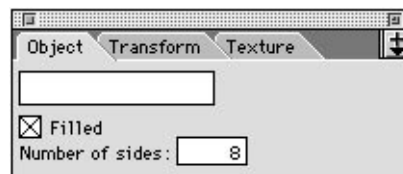
You can assign a name or edit the existing name, and change the filled/unfilled

status of the polygon at any time. For information on the other tabs found on the **Object Properties Palette**, *see page 197.*

CONSTRUCTION TOOLS

This section of the Tool Palette contains tools to assist you in the construction of your model. It includes the Spot and Point Light tool, Camera Object, Grid, and the Link tool. Construction objects are not normally visible when rendered.

Point Light tool — *Spotlight tool*
Camera Object tool — *Grid tool*
Link tool — *Unlink tool*
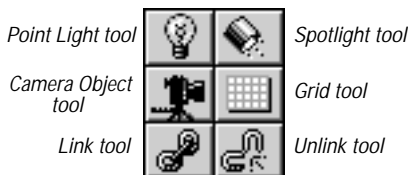
POINT LIGHT TOOL

Use this tool to insert non-directional light sources into a model.

TOOL SETTINGS

You can change the default settings of the Point Light tool. Double-click on the tool to access the *Tool Settings* dialog.
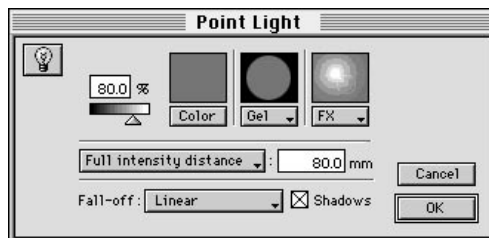
- **Intensity**. Use the slider to adjust the intensity of the point light, or enter a value in the numeric entry field above the slider. A setting of zero produces no illumination, and a setting of 100 is maximum illumination.

- **Color**. To specify the color of the point light, click the *Color* button to display the *Color Picker* dialog.

- **Gel**. If you want the default point light to have a gel applied to it, you can specify one here. A gel that contains a map projects the pattern or image onto the objects that the light illuminates.

  The *Gel* pop-up menu allows you to add, edit, apply, or remove gels.

  Loaded gels

  Gels available in the library
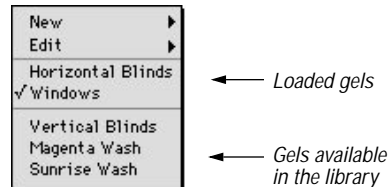
  The top section contains commands for creating new gels or editing gels that are already loaded.

  The center section contains gels that are currently loaded in the active model. Any gel associated with the default point light appears with a check beside its name.

  To create a new gel, select **NEW...** from the *Gel* pop-up menu.

For complete instructions on creating a new gel, *see* **Creating Gels** *on page 176.*

Once you've created a gel, it appears in the center of the pop-up menu with a check beside its name.

To edit a gel, select one from the *Edit* sub-menu. All gels currently loaded in the active model appear in the *Edit* sub-menu.

The appropriate dialog appears, allowing you to modify the current settings.

To apply a gel to the default point light, select one from the *Gel* sub-menu.

Selecting a gel from the lower section... *...moves it to the center with other loaded gels.*
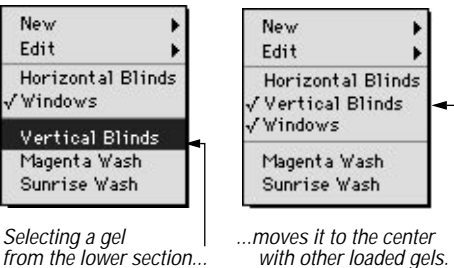
When you select any gel from either the center section (loaded gels) or the lower section (all gels available in the library), a check is placed beside the name of the gel, indicating that this gel will be applied to the default point light.

To remove a gel from the default point light, select it again; the check mark is

removed from beside its name, indicating that it is no longer applied.

• **FX**. You can apply a lens flare or atmospheric effect to the default point light. To make the point light visible, apply an atmosphere to it. Any atmosphere attached to a point light is visible in the area illuminated by that light.

The *FX* pop-up menu functions in the same manner as the *Gels* sub-menu.

Loaded effects

Effects available in the library.
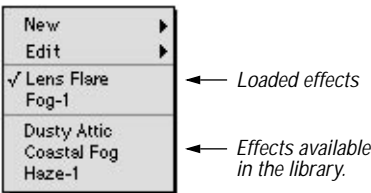
Any effect currently associated with the default point light appears with a check beside its name in the center section of the menu.

To create a new effect to use with the default point light, select one from the *New* sub-menu.
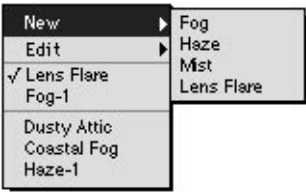
The appropriate dialog appears. For information on creating new effects, *see* **Fog** *on page 165,* **Haze** *on page 166,* or **Mist** *on page 171.* For instructions on creating a lens flare, *see* **Lens Flare** *on page 171.*

To edit an existing effect, select one from the *Edit* sub-menu. All effects that are currently loaded appear in this sub-menu.
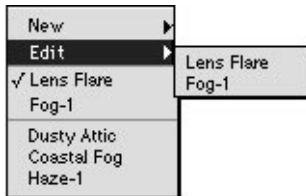
Depending on your selection, the appropriate dialog is displayed. This is the same dialog used when the effect was originally created.

To apply an effect to use on the default point light, select one from either the center section (loaded effects) or the lower section (all effects available in the library).

Selecting an effect from the lower section... ...moves it to the center with other loaded effects.
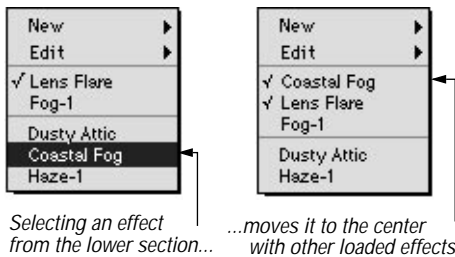
A check is placed beside the name of the effect, indicating that it will be associated with the default point light.

To remove an effect from the default point light, select it again; the check mark is removed from beside its name, indicating that it is no longer applied.

- **Light source radius**. To define the default radius of the light source, select

Light source radius from the pop-up directly below the slider. This setting influences the degree to which soft shadows are calculated when using the Raydiosity renderer. The larger the light source, the softer the shadows appear.

- **Full intensity distance**. To define the distance of full intensity illumination, select *Full intensity distance* from the pop-up. Enter a value to be used as the default setting for point lights.

- **Total fall off distance**. Select *Total fall off distance* from the pop-up menu to define the total distance the illumination travels away from the point light before it completely disappears. Objects just inside the fall-off distance may not appear illuminated, even though they are, because the amount of light at that distance is so low. Objects that lie outside this distance are not illuminated by the light source at all.

- **Shadows**. There may be special cases where you don't want the objects illuminated by the point light to cast shadows.

- **Fall-off**. You can specify the method used for calculating the rate of fall off.

   Linear - light diminishes at an even rate.

   Exponential - the rate of fall-off increases with distance.

TOOL FUNCTION

Unlike global lights, which are designed to illuminate the entire model, point lights

are designed to illuminate small areas of the scene. Point lights always shine outward in all directions from the source. There's no limit to the number of point lights you can insert into your model.

To insert a point light, select the Point Light tool and click in the modeling window. Notice that the appearance of the cursor changes to resemble a light bulb when this tool is selected. A point light marker is placed on the active grid at the position the cursor is clicked. Markers appear in the modeling windows, but they don't show in the rendered image.

Click once with a selection tool on the point light marker to select it. You can see the area illuminated by the light.

Illumination Adjustment rings

Area of full intensity

Partial shadows

Fall-off point
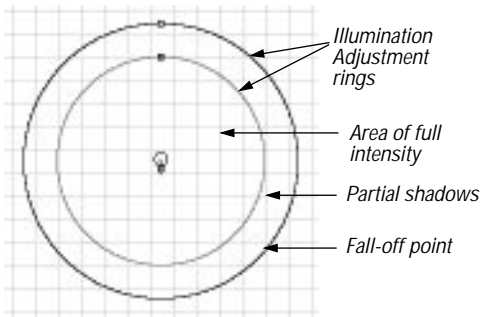
The inner circle represents the area of the model illuminated by the light with full intensity.

The section between the two circles represents that area of the model that resides in partial shadows. Any objects lying outside the outer circle do not receive any illumination whatsoever from the point light. If *Total fall-off distance* is set to INF (infinity) in the *Tool Settings* dialog, the

outer circle doesn't appear because it's infinite in size.

You can change the radius of these circles, if visible, by grabbing anywhere on either ring and dragging it to the desired size. If *Total fall-off distance* is set to INF and you want to change it to a specific value, you will need to change the *Total fall-off distance* value on the Object Properties Palette because you won't have access to the outer circle in the modeling window.

A gel or an atmospheric effect, such as mist or fog, can be applied to a point light by dragging it from the Resource Palette and dropping it onto a point light in the modeling window.

You can move the point light to a different position on the active grid with the Object Move tool. To move the point light perpendicular to the active grid, use the Command + Shift keys. You can also change the position of the spotlight on the *Transform* tab on the Object Properties Palette. *See* **Transform Tab** *on page 199*.

Modifier keys for moving point lights with the Object Move tool in the modeling window:

• **Shift key** constrains the motion of the point light to 45-degree increments on the active grid or on a plane parallel to the active grid.

• **Option key** leaves a copy of the point light behind.

• **Command** + **Shift keys** moves the point light or the target point perpendicular to the active grid.

Object Properties Palette

Once you've inserted a point light into your model, you can edit it on the *Object* tab of the Object Properties Palette.
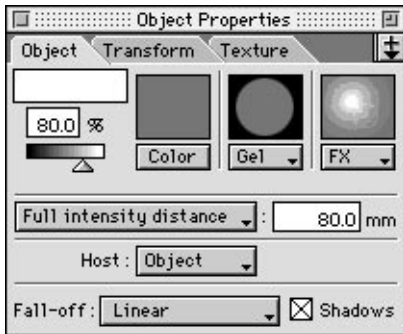
The *Tool Settings* dialog and the *Object* tab of the Object Properties Palette contain many of the same fields. Therefore, if you require additional information about any of the following fields, *see* **Tool Settings on page 113**.

- **Name**. This field contains the name of the selected point light, if a name has been specified. You can add a name to this field, or change the existing name at any time.

- **Intensity**. This setting indicates the intensity of the point light. You can change this setting by moving the slider or by entering a value in the numeric entry field above the slider.

- **Color**. This field displays the color of the selected point light. To change the color, click the *Color* button and the *Apple Color Picker* dialog appears, allowing you to select a new color for the light.

- **Gel**. This field indicates any gels applied to the selected point light. A list of pre-defined gels appear in the *Gels* pop-up menu. You can also add, edit, apply, or remove gels from the selected point light from the *Gel* pop-up menu.

- **FX**. This field indicates any effects, such as lens flares, fog, or mist, that are applied to the selected point light. You can add new effects, modify existing ones, or remove current effects from the *FX* pop-up menu.

- **Light source radius**. This setting influences the degree to which soft shadows are calculated when using the Raydiosity renderer. The larger the light source radius, the softer the shadows appear.

- **Full intensity distance**. This setting determines the distance illuminated at full intensity.

- **Total fall off distance**. The value in this field determines the total distance light travels from the selected point light.

- **Host**. You can attach the selected point light to an object in the model. All objects in the active model appear in the *Host* pop-up menu. When you move the host, the light moves with it.

- **Fall-off**. This setting indicates the method used for calculating the rate of fall off.

- **Shadows**. This field indicates whether or not objects illuminated by the selected point light cast shadows.

For complete details on this palette, *see* **Object Properties Palette** *on page 197.*

SPOTLIGHT TOOL

Use this tool to insert spotlights in a model.

TOOL SETTINGS

To change the default settings, double-click the Spotlight tool on the Tool Palette to display the *Tool Settings* dialog.
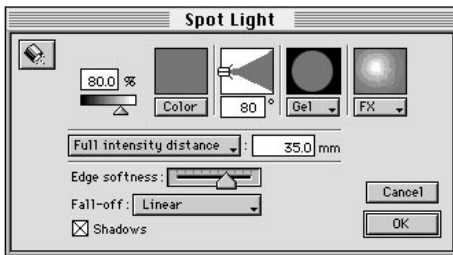
- **Intensity**. You can set the intensity of the default spotlight interactively, by adjusting the intensity slider; or numerically, by entering a value in the numeric field above the slider. A setting of zero produces no illumination, and a setting of 100 is maximum illumination.

- **Color**. You can specify the color of the default spotlight. The *Color Picker* dialog opens when you click the *Color* button.

- **Cone Angle**. Enter a value in the numeric field directly below the cone angle preview. The value entered can be from 1° to 180°.

- **Gel**. You can apply a gel to the default spotlight, causing the pattern or image of the gel to project onto any objects illuminated by the spotlight.

The *Gel* pop-up menu allows you to add, edit, apply, or remove gels.

Loaded gels

Gels available in the library.

The top section of the menu contains commands for creating new gels or editing gels that are already loaded in the active model.

The center section of the menu contains gels that are currently loaded in the active model. Any gel associated with the default spotlight appears with a check beside its name.

To create a new gel, select **NEW...** from the *Gel* pop-up menu.

The *Image Gel* dialog is displayed, allowing you to create a new custom gel that will be applied to all spotlights created with the Spotlight tool. For complete instructions on creating a new gel, *see* **Creating Gels** *on page 176.*

Once you've created a gel, it appears in the center of the pop-up menu with a check beside its name. It also appears in the upper portion of the Resource Palette with other gels that are loaded in the active model.

To edit an existing gel, select one from the *Edit* sub-menu. All of the gels that are currently loaded in the active model appear in the *Edit* sub-menu.

When you select an effect to edit, the appropriate dialog appears, allowing you to modify the current settings as desired.

To apply a gel to the default spotlight, select one from the *Gel* sub-menu.

Selecting a gel from the lower section... ...moves it to the center with other loaded gels.
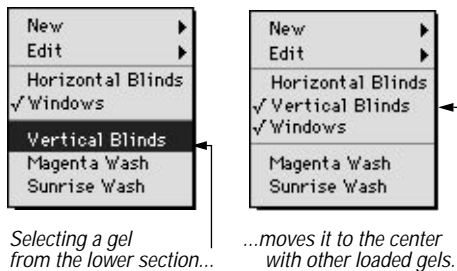
A check is placed beside all gels that are currently associated with the default spotlight.

To remove a gel from the default spotlight, select it again; the check mark is removed from beside its name, indicating that it is no longer applied.

• **FX**. You can apply a lens flare or atmospheric effect to the default spotlight. To create a visible light, apply an atmosphere to the spotlight. Any atmosphere attached to a light is visible in the area illuminated by that light.

The *FX* pop-up menu functions in the same manner as the *Gels* sub-menu.

Loaded effects.

Effects available in the library.
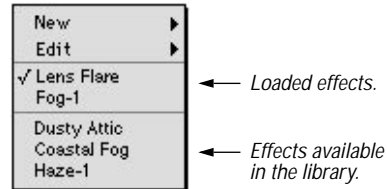
A check appears beside all effects associated with the default spotlight.

To create a new effect to associate with the default spotlight, select an atmospheric effect or lens flare from the *New* sub-menu.
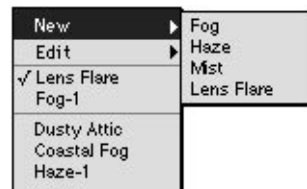
The appropriate dialog appears. For information on creating new effects, *see* **Fog** *on page 165*, **Haze** *on page 166*, and **Mist** *on page 171*. For instructions on creating a lens flare, *see* **Lens Flare** *on page 171*.

To edit an effect, select one from the *Edit* sub-menu. All currently loaded effects appear in this sub-menu.
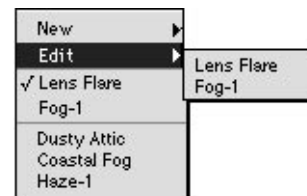
Depending on your selection, the appropriate dialog is displayed.

To apply an effect to use on the default spotlight, select one from either the center section (loaded effects) or the lower section (all effects available in the library).

Selecting an effect from the lower section... *...moves it to the center with other loaded effects.*
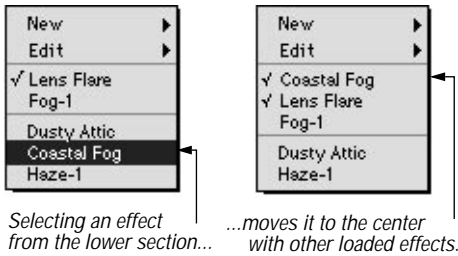
A check is placed beside the name of the effect, indicating that it will be associated with the default spotlight.

To remove an effect from the default spotlight, select it again; the check mark is removed from beside its name, indicating that it is no longer applied.

- **Light source radius**. Select *Light source radius* from the pop-up list below the *Intensity* slider to specify the default radius of the spotlight. This setting influences the degree to which soft shadows are calculated when using the Raydiosity renderer. Larger values result in softer shadows.

- **Full intensity distance**. Select *Full intensity distance* to specify the distance illuminated at full intensity.

- **Total fall off distance**. To specify how far the illumination travels, select *Total fall off distance* from the pop-up list. This value is the absolute maximum dis-

tance that an object will be illuminated by the spotlight. If you place an object just inside this distance, it may not appear illuminated even though it is, because the amount of light is so low.

- **Edge Softness**. This slider lets you set the softness of the edges around the light.

- **Fall**-**off**. You can specify the method used for calculating the rate of fall off.

  Linear - light diminishes at an even rate.

  Exponential - the rate of fall-off increases with distance.

- **Shadows**. When this box is checked, objects illuminated by the spotlight cast shadows. There may be special cases where you don't want the objects illuminated by this light to cast shadows.

TOOL FUNCTION

Spotlights are designed to illuminate small areas of the scene. Spotlight markers are visible in the modeling windows, but they don't show in a rendering. Only the lighting effects are visible in the rendered image. There's no limit to the number of spotlights you can insert into your model.

When this tool is selected, the appearance of the cursor changes to resemble an actual spotlight. To insert a spotlight, click in the modeling window. A spotlight marker is placed on the active grid and points in a direction perpendicular to the grid. The marker does NOT indicate the direction the light is shining; it merely marks the position of the spotlight in the model.

Aiming Spotlights

When you select the spotlight marker, the direction and area of illumination is indicated.

Grab the target point and drag it so it points in the desired direction.

This line indicates the "up" direction
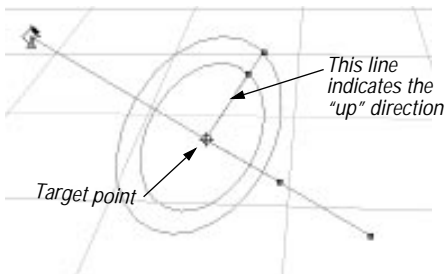
Target point

If you want the spotlight to always point at a particular object, drag the target to that object. When the target point passes over the object, the object highlights in red. If you release the mouse button while the object is highlighted in red, the spotlight becomes attached to the object.

When the object highlights in red, release the mouse button.
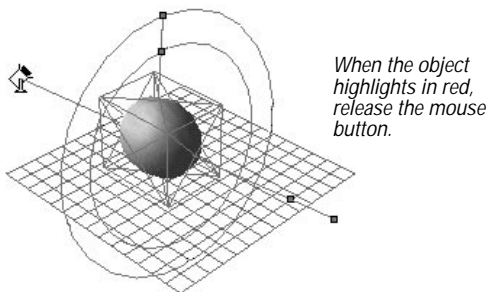
Then, if you move either the object or the spotlight, the spotlight remains pointed at the target object. To ignore all of the objects, hold down the Option key while dragging the target point. As the target passes over objects, the objects highlight in green, indicating that the spotlight is

aimed at the object, but not attached to it. This allows you to point the spotlight at an object in space, but when the object is moved, the spotlight doesn't follow it. Instead, the spotlight remains aimed at the same position in space.

The inner circle represents the area of full intensity of the cone of light. The area between the outer and inner circles represents the penumbra, or area of partial shadows. This is the area around the edges of the cone of light, and it determines the edge softness. It is the area between total illumination and total shadow. To change either the inner or outer circles, grab anywhere on the ring and drag to increase or decrease the area as desired.

Indicates "up" direction

Illumination Rotation handles

Area of full illumination

Fall-off begins at this distance.

Penumbra
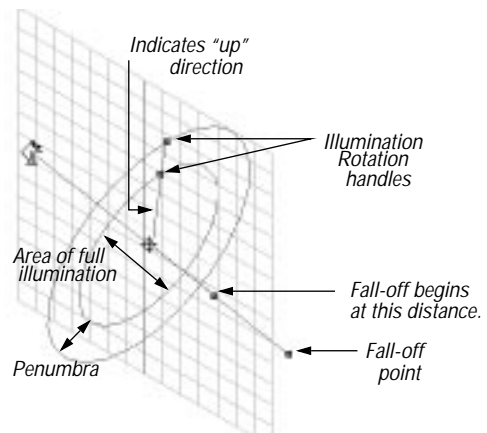
Fall-off point

The location of the *Fall-off* point represents the distance at which the light no longer illuminates objects. If *Total fall-off distance* is set to INF (infinity), the *Fall-off* point will be inaccessible in the modeling window; if you want to change the fall-off distance, you'll need to change the value on the Object Properties Palette. Note that the fall-off may not appear accurately in

the modeling window, but it will render correctly.

To move the spotlight in the modeling window, use the Object Move tool. The spotlight always remains pointed at the target point. If you grab the spotlight, the spotlight moves, but the target point remains in place. If you grab the target point instead, the point moves, but the spotlight remains in place. If you grab the line connecting the target point and the spotlight, both move together in unison.

To move the spotlight or the target point perpendicular to the active grid, use the Command + Shift keys.

A gel or an atmospheric effect, such as mist or fog, can be applied to a spotlight by dragging it from the Resource Palette and dropping it onto a spotlight in the modeling window.

The "up" direction of the spotlight is also indicated. Normally, a spotlight's "up" vector is insignificant. However, if a gel containing an image map has been applied to the spotlight, you may want to rotate the gel. The gel itself cannot be rotated, but rotating the spotlight has the same effect.

When you first insert a spotlight into the modeling window, the *Steady Spotlight* option is disabled. To rotate the spotlight, grab an *Illumination Rotation handle* and rotate the spotlight to the desired position. If you want to constrain the spotlight so its "up" vector always remains pointing in the "up" direction (in world coordinates), you may do so from the Spotlight window.

A spotlight window is provided to assist you in accurately positioning spotlights in

your model. To display the spotlight window, double-click the spotlight icon in the modeling window.
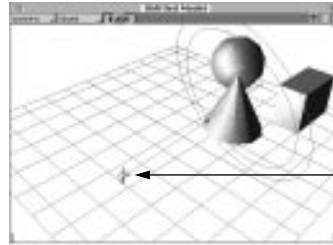
Double-click spotlight icon

The window for that spotlight opens. This window allows you to "see" which objects are illuminated by the spotlight.
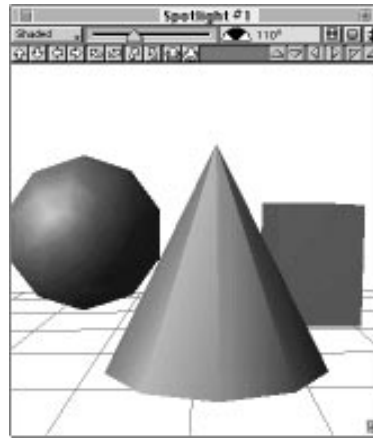
Controls are provided at the top of the window to assist in precise positioning of the spotlight. For more information, *see* Spotlight Window *on page 241.*

Modifier keys for moving spotlights with the Object Move tool in the modeling window:

• **Shift key** constrains the motion of the spotlight to 45-degree increments on

the active grid or on a plane parallel to the active grid.

- **Command key** moves the spotlight closer to, or away from the target point (along a straight line connecting the two).

- **Option key**, while moving a spotlight, leaves a copy of the spotlight behind.

- **Option key**, while positioning the target point, ignores all objects. You can aim the spotlight at a position in space rather than at an object.

  If an object is already linked to a spotlight, holding down the Option key while grabbing the target point removes the link to that spotlight. (In order for the target point to be visible, however, you'll need to be in either *Wireframe* or *PointCloud* display mode.)

- **Command** + **Shift keys** moves the spotlight or the target point perpendicular to the active grid.

Object Properties Palette

You can also edit the selected spotlight on the Object Properties Palette.

- **Name**. This field contains the name of the selected spotlight. A default name is provided, but you can change the name in this field at any time, if desired. All spotlights must be named, and the name must be unique. The name of the spotlight also appears in the **SPOTLIGHT WINDOW** sub-menu in the Windows menu, as well as in the Project Window.

- **Intensity**. This setting indicates the intensity of the selected spotlight.

- **Color**. This setting indicates the color of the selected spotlight. To change the color, click the *Color* button.

- **Gel**. This setting indicates the gel applied to the selected spotlight. For information on adding, modifying, or removing gels from the selected spotlight, *see page 118.*

- **FX**. This field indicates any effects or atmospheres applied to the selected spotlight. You can add, edit, apply, or remove an effect or atmosphere from the *FX* pop-up menu. For complete information, *see page 119.*

- **Light source radius**. This setting influences the degree to which soft shadows are calculated when using the Raydiosity renderer. The larger the light source radius, the softer the shadows appear.

- **Full intensity distance**. This setting indicates the distance illuminated at full intensity.

- **Total fall off distance**. This setting indicates the absolute maximum distance at which an object is illuminated by the spotlight.

- **Target**. The *Target* pop-up menu lists all of the objects in the active model. If you've attached the spotlight to an object in your model, that object appears here.

- **Host**. You can attach the spotlight to a host object. Then, when the host moves, the spotlight moves with it.

- **Track**. Select a tracking style. This field is set to *Swivel* and grayed out if a *Host* is selected.

  No Link - This option unlinks the spotlight from the target.

  Hard Link - If the target moves, the spotlight moves as though welded to it.

  Swivel - The spotlight swivels to follow the target object.

  Chase - The spotlight chases a moving object with it's own gravity.

- **Cone Angle**. This field indicates the cone angle of the selected spotlight. This value can be from 1° to 180°.

- **Edge Softness**. This setting indicates the softness of the edges around the light.

- **Fall-off**. This setting indicates the method used for calculating the rate of fall-off.

- **Shadows**. When this box is checked, objects illuminated by the spotlight cast shadows.

For information about the other tabs on the Object Properties Palette, *see* **Object Properties Palette** *on page 197*.

CAMERA OBJECT TOOL

The Camera Object tool inserts camera objects in the model.

TOOL SETTINGS

You can specify the default settings for the camera objects you insert into your model. To access the *Tool Settings* dialog, double-click on the Camera Object tool.
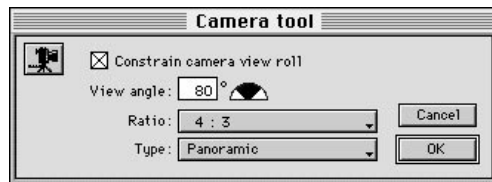
- **Constrain camera view roll**. This feature keeps the camera's "up" vector always in the "up" position. When this box is checked, the *Steady Camera* option is enabled.

- **View Angle**. The view angle can be entered numerically by entering a value in this field, or interactively by grabbing the *View Angle Control* and adjusting it as desired.

- **Ratio**. Select an aspect ratio from the *Ratio* pop-up list. *See* **Appendix B** *on page 259* for a description of the most commonly used aspect ratios.

- **Type**. Select the type of camera used from the *Type* pop-up menu.

  Panoramic - This camera produces a 360-degree rendering, which can then

be converted to a Panorama Quick-Time VR movie.

TOOL FUNCTION

When this tool is selected, the cursor changes its appearance to look like a real camera. To add a camera object to a model, click in the modeling window. A camera marker is placed on the active grid and is aimed in a direction perpendicular to the grid.

If Caps Lock is on, the cursor changes to a cross-hair cursor so you can more accurately position a camera in the model.

Camera Object cursor

with Caps Lock on

The camera marker resembles an actual camera. The marker does NOT indicate the direction the camera is actually facing; it merely marks the location of the camera in the model.

There is no limit to the number of camera objects that can be inserted. You can position them anywhere in 3-D space. Camera markers are visible in modeling views, but they don't appear in renderings.

When you select the camera, the direction the camera is facing, as well as the portion of the model visible through the camera, is indicated. The "up" direction is indicated

by a line that runs from the target point to the outer perimeter of the viewing angle.

Target point (Look-At point)

Indicates "Up" direction

Grab anywhere on the perimeter to resize
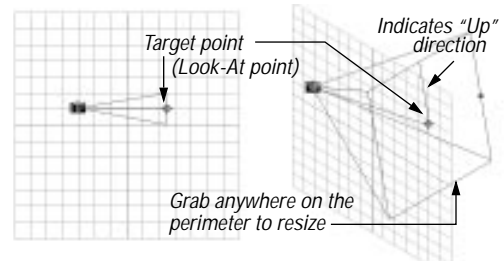
Viewed from straight on   *and from an isometric view*

To point the camera, grab the target point and position it to point in the desired direction.

To increase or decrease the area visible through the camera's viewfinder, grab anywhere on the rectangular bounding box and drag to the desired size.

If you disable the *Steady Camera* option, a handle is provided to rotate the camera's view.

Camera View Rotate Handle
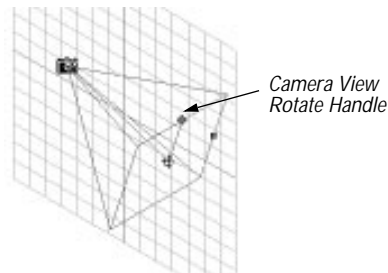
You can disable the *Steady Camera* option on the *Object* tab of the Object Properties

Palette or with the controls provided at the top of the Camera window.

If you want the camera to always look at a particular object, drag the target point to that object. As the target point passes over an object, that object becomes highlighted in red; then release the mouse button. The camera is now associated with the object; regardless of whether you move the camera or the object, the camera will always remain pointed at that object.

If you hold down the Option key while dragging the target point, all objects are ignored, allowing you to aim the camera at a position in space, rather than aiming at a particular object. As the target point passes over an object, it highlights in green, indicating that the camera is aimed at that object, but not attached to it. If you move the object, the camera is no longer aimed at the object.

To adjust the view angle of the camera, grab the *View Adjustment* handle and drag it to the desired position. The size of the camera window does not change; only the focal length changes.

You can move the camera object in the modeling window with the Object Move tool. The camera always remains pointed at the target point. If you grab the camera, the camera moves, but the target point remains fixed. If you grab the target point, that point moves, but the camera remains in place. If you grab the line between the camera and the target point, both the camera and the target point move together.

Unless you're working in an orthographic view, moving the camera toward or away from a target point works just as it does

with a real camera. When you move the camera farther away from the target point, the area of the model that's visible through the camera's viewfinder increases; if you move the camera closer to its target, the visible area decreases.

You can move a camera freely anywhere on the active grid. To move the camera perpendicular to the active grid, hold down both the Command and Shift keys. To move the camera closer to or away from the target point (along a straight line connecting the two), hold down the Command key only.

Modifier keys for moving cameras with the Object tool in the modeling window:

- **Shift key** constrains the motion of the camera to 45-degree increments on the active grid or on a plane parallel to the active grid.

- **Command key** moves camera closer to or away from the target point (along a straight line connecting the two).

- **Command+Shift keys** move camera or the target arrow perpendicular to the active grid.

- **Option key**, when moving the camera, leaves a copy of the camera behind.

- **Option key**, when aiming the target point, holding the Option key down ignores all objects, allowing you to aim at a position in space rather than at a particular object.

Once you've inserted a camera in the modeling window, you can view the model through the camera's "viewfinder" by either double-clicking on the camera

object or choosing it by name from the **CAMERA WINDOW** sub-menu in the Windows menu.

Navigator
controls
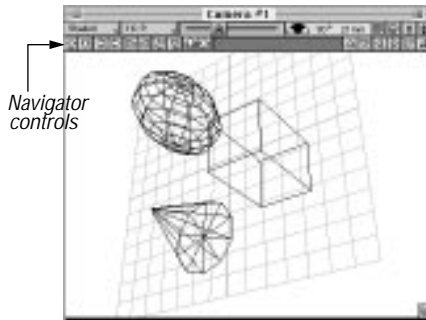
For complete details on these commands, *see* Camera Window *on page 237*.

ADJUSTING A CAMERA'S SETTINGS

A camera object has several settings that control the way it operates in a model. These settings can be changed on the *Object* tab of the Object Properties Palette. In addition to the controls found on this palette, controls for aperture radius, focus distance, lens thickness, and film size are also provided in the Project Window.
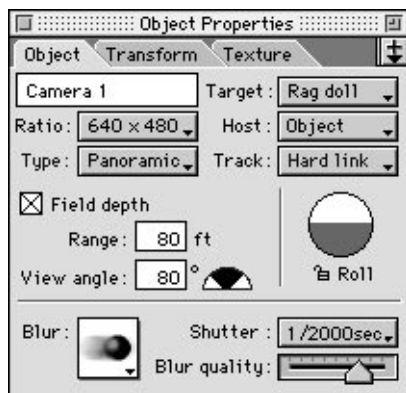
- **Camera name**. When you insert a camera object in a model, it is given a

default name which can be changed. The name of the camera also appears in the **CAMERA WINDOW** sub-menu in the Windows menu, as well as in the Project Window.

- **Ratio**. The setting in this field determines the aspect ratio used. This ratio is not time variable. When changed, the new setting becomes a global setting which effects all frames of a rendering. *See* **Appendix B** *on page 259* for a list of the most commonly used aspect ratios.

- **Type**. This setting determines the type of the selected camera. When *Panoramic* is selected, some of the other fields do not apply.

- **Target**. You can select any object present in the active model to associate with the selected camera.

- **Host**. You can attach the selected camera to a host. Then, when the host object moves, the camera moves with it. This setting defaults to *None.*

- **Track**. Select a tracking style. This field is set to *Swivel* and grayed out if a *Host* is selected.

  No Link - This option removes the existing target from the selected camera.

  Hard Link - If the target moves, the camera moves as though welded to it.

  Swivel - The camera swivels to follow the target object.

  Chase - The camera chases a moving object with it's own gravity.

- **Field Depth/Range**. When the *Field Depth* box is checked, the value in the *Range* field determines the total distance in front of and behind the target where objects will remain relatively

focused. If the *Field Depth* check box is unchecked, the *Range* field is dimmed.

• **Roll**. You can interactively rotate the camera when the *Steady Camera* feature is disabled. To disable Steady Camera, click the lock icon beneath the control.

When the lock icon is in its "unlocked" position, you can grab the control and rotate it to any position.
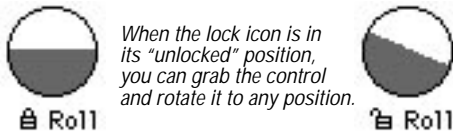
This feature can also be disabled from the camera window. This has the same effect as using the *Camera View Rotate Handle* in the modeling window. When the *Steady Camera* option is enabled, this control is dimmed and unavailable.

• **View Angle**. This setting determines the amount of perspective. A value can be entered directly in this field, or you can specify the view angle interactively with the *View Angle Control*. You can also adjust the view angle by adjusting the *Perspective* slider in the camera window.

• **Blur**. Motion blur occurs when objects move while the camera's shutter is open. You can control the softness of the blur behind an object, creating an especially realistic effect. Select a blur effect from the *Blur* pop-up list.
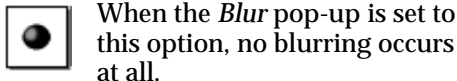
When the *Blur* pop-up is set to this option, no blurring occurs at all.

When this option is selected, blurring occurs evenly in front of, and behind the image. This option produces the most realistic blur-

ring effect and is the normal result of too slow a shutter speed.

When this option is selected, motion is blurred in both directions. The shutter opens more slowly than it closes, causing more blurring to occur behind the image than in front of it.

When this option is selected from the *Blur* pop-up menu, almost all blurring occurs behind the image. This occurs when the shutter opens slowly and closes very rapidly.

When this option is selected, almost all blurring occurs in front, causing the image to look as though it's moving backward. This occurs when the shutter opens very rapidly and closes slowly.

• **Shutter speed**. This field determines the speed of the shutter, in fractions of a second.

• **Blur Quality**. Higher quality settings may require significantly longer rendering times. StudioPro must render additional images, and then composite the intermediate renderings to create a blur effect.

For a complete description of the other tabs on this palette, *see* **Object Properties Palette** *on page 197*.

GRID TOOL

The Grid tool is provided to create user-defined grids, but it can also be used to resize world and user-defined grids. To

access any grid present in the active model, use the plus (+) or minus (-) keys to cycle forward or backward through the grids.

For information on world grids and view-relative grids, *see* Modeling Window *on page 231*.

TOOL FUNCTION

The Grid tool is provided to define your own grids for use in modeling individual objects. It can also be used to resize the visible portion of world and user-defined grids.

User-defined Grids

User-defined grids are different than world grids in that they are initially drawn directly on an object, but they can be re-positioned anywhere in your model. User-defined grids appear orange.

To change the pointer cursor to the cross-hair cursor, turn on Caps Lock.

Pointer cursor

Cross-hair cursor

Like all grids in StudioPro, user-defined grids are infinite in size. With the grid tool selected, click on the object and drag to define the size of the visible portion of the grid. The exact position of the initial mouse click determines the orientation of the grid.

User-defined grids are drawn on the face of the object perpendicular to the surface

normal (the direction the surface is pointing) at the precise location where the mouse is clicked.

User-defined grids are always drawn from the center instead of the corner. This is useful when drawing a grid on an irregular-shaped object.

The grid appears with handles on the sides and corners that are used for resizing, and two center handles that are used for re-positioning the grid.
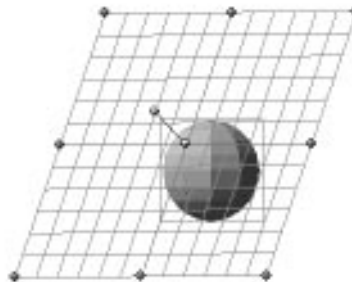
To resize the grid, grab a side handle and drag to the desired size with the Grid tool.
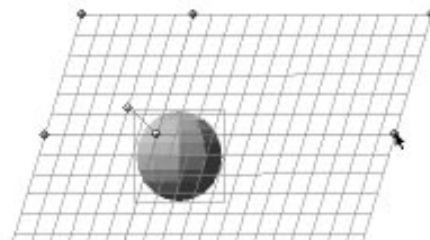
Remember, the grid is actually infinite in size; you're resizing only the portion that's visible in the modeling window.

To rotate the grid, grab a corner handle and drag. The grid rotates in its own plane only.
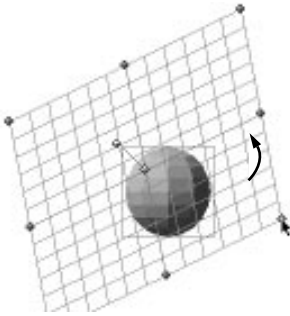
To tilt the grid on any axis, grab the center handle that resides ABOVE the surface of the grid, and rotate it in any position. The grid rotates around its center.

Grab this handle to rotate the grid freely around the grid's center point.
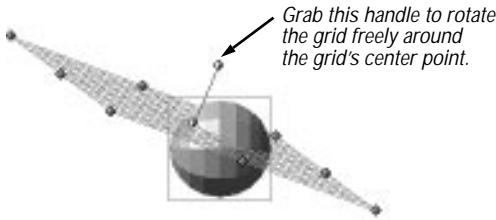
To move the grid to another location in the modeling window, grab the center handle that resides ON the grid, and drag it to the desired position. Only the grid moves; the objects in the model are completely unaffected.

Grab this handle to move the grid to a new position in the modeling window.
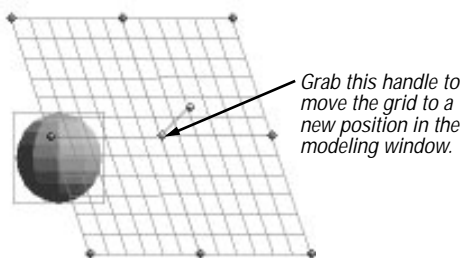
To delete a user-defined grid, select the grid you want to delete with the grid tool, then press the Delete key.

To cycle through all user-defined grids in your model, use the Option-Plus(+) keys to cycle forward or the Option-Minus(-) keys to cycle backward. Without the Option key, the Plus (+) or Minus (-) keys cycle in order through both world and user grids.

Object Properties Palette

You can edit user grids on the Object tab of the Object Properties Palette.
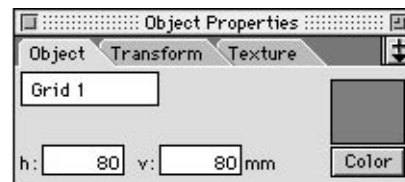
- **Name**. This field contains the name of the selected grid. All grids must be named; therefore, a default name is provided at the time the grid is created. However, you can edit the name of the grid at any time.

- **Dimensions**. You can adjust the size of the grid displayed in the modeling window. Grids are actually infinite in size, but these fields allow you to specify the size of the visible portion of the grid.

- **Color**. User-defined grids always appear orange when they're first created, but you can change the color of the selected grid by clicking the *Color* button. The color picker dialog is displayed, allowing you to specify a new color.

RESIZING WORLD GRIDS

The Grid tool can also be used to resize a world grid. World grids cannot be rotated or moved, but you can increase or decrease the visible portion of the grid.

Use any handle to resize the grid to the desired size.
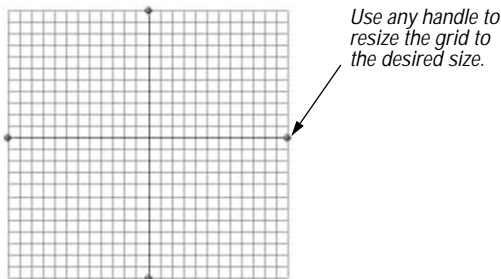
Grab a side handle and drag to resize it. Remember, you can only size the *visible* portion of the grid; its actual size is infinite. For more information on the world grids, *see page 235*.

LINK TOOL

 Use the Link tool on the Tool Palette to establish a link between two objects.

TOOL SETTINGS

You can change the default settings by double-clicking the Link tool.
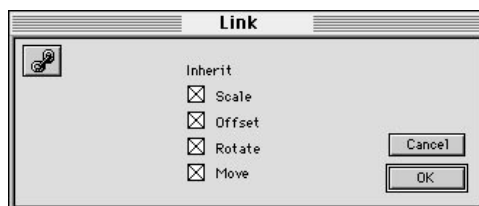
The *Tool Settings* dialog is displayed.

- **Scale**. If this box is checked, links created with the link tool will cause all child objects to scale together with the parent when the parent object is scaled.

- **Offset.** Check this box if you want the child to inherit the distance that the parent's object origin point is offset from its geometric center.

- **Rotate**. When a parent object is rotated, all child objects linked to that parent will also rotate if this box is checked.

- **Move**. When a parent object is moved, all child objects linked to that parent will move with it.

When none of the boxes are checked, moving, rotating, or scaling the parent object has no effect on the child. However, if the parent object is deleted, all child objects linked to the parent will also be deleted.

TOOL FUNCTION

This tool can be used to link objects, light sources, or cameras together. The link connection is used primarily for constraining an object's movement during animation sequences.

The Link tool makes the link connection between the child and parent. Select the child first, then drag the link cursor to the parent. Each object becomes highlighted in turn as the link is made.

The order of selection is very important. When you move a parent object, the child

object moves also. However, you can move the child object without affecting the parent object.

All child objects appear beneath the parent object in the hierarchical structure in the Project Window.

You can't link a child to two different parents. If you attempt to so, the first link is broken. No alert is given to indicate the change in linking; therefore, you must keep track of which objects are linked together.

UNLINK TOOL

Use the Unlink tool to select the objects from which you want the links removed.

With the Unlink tool, select the object that you want to unlink, and then drag to the object you want to unlink from. You can unlink multiple objects by continuing to select objects with the Unlink tool.

IMAGING TOOLS

The Rendering tool is used for taking snapshots or creating animations. It also lets you add stylized effects to the completed rendering.

RENDERING TOOL

You can choose the type of rendering tool you want to use from the Rendering tool's pop-up menu. You can choose to render a

single frame or multiple frames of an animation.

Stills. Use the snapshot tool to render still images of your model. The snapshot tool automatically becomes the selected rendering tool.

Movies. If you select a preset from the *Movies* sub-menu, the Rendering tool changes to a movie reel to indicate that options have been selected for rendering animations.

If the Caps Lock is on, the cursor changes it appearance so you can more accurately position a camera in the model.

Rendering tool cursor

with Caps Lock on

The images are rendered in separate rendering windows. A rendering can be initiated from several different locations: the modeling window, a camera or spotlight window, or the Project Window.

You can initiate a rendering in one of three ways:

• **Single click**. The size and proportion of the rendering, as well as the viewing position, is determined by the size of the view where the camera cursor was clicked.

• **Cursor drag**. The size and proportion of the rendering is determined by the marquee drawn with the cursor. The viewing position of the rendering is

based on the view from where the cursor was dragged.
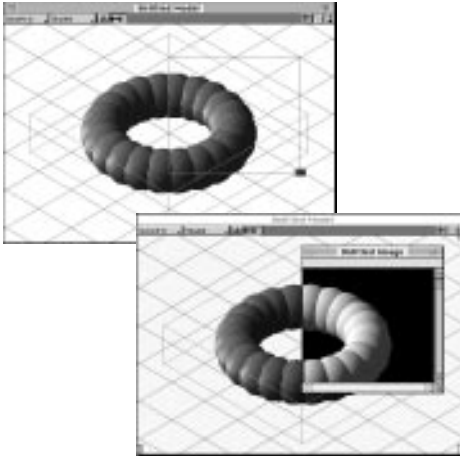
• **Use the Render command**. Select the **RENDER** command from the Rendering menu to display the *Render* dialog. This command allows you to specify the complete set of rendering parameters, including image size, image quality, resolution, and animation frames, if applicable, before the rendering starts. For complete information on using this dialog, *see* **Render** *on page 51*.

If you hold down the Shift key while clicking or dragging the tool in a view, or if the selected rendering settings use of the *Anti-Aliasing* filter, the *Render* dialog also appears. The currently

active view determines the viewing position for the rendering.

Custom Rendering Options

You can define a particular set of rendering options that you can recall later, either in the current project or in another model. *See* **Saving Custom Settings** *on page 61* for details.

These custom settings will then appear in the list of presets available in the Rendering tool's pop-up menu.

You can delete an entry from the *Custom* rendering options list by holding down the Option key while selecting the name of the preset you want to delete. When you release the mouse button, the system beep will sound to confirm the deletion of that entry in the list. You cannot undo this action.

If you change your mind, you can always add the preset again by manually selecting the same rendering options and saving them to the list.

Modifier keys that apply to initiating renderings using the Rendering tool:

• **Shift key** opens the *Render* dialog box. Without the Shift key, clicking or dragging the Rendering tool immediately begins a rendering.

• **Option key** draws the camera's cursor drag marquee from its center, instead of the corner.

Close box   Title bar   Preview area   Plus Menu

The upper section of the Resource Palette contains all of the resources loaded in the active model.

The lower section of the Resource Palette displays all of the resources available in the Resource Library.

Library button

Pop-up list of resources

Scroll to view all textures in library

Resize box

Click the Library button to condense the palette to display only the resources that are loaded into the model

Use arrows to view additional tabs, if necessary

The Resource Palette places all of the resources available to you in one convenient location. The palette includes resources for textures, shapes, and special effects.

This palette includes the standard Macintosh controls, as well as some specialized controls that allow you to import or create new resources to add to the palette. You can also edit any existing resources to meet your needs.

To close the Resource Palette, select **HIDE RESOURCE PALETTE** from the Windows menu, or click the close box in the upper left corner of the palette. You can also close

this palette by clicking the Resource Palette's hide/show button on the Button Bar.

Resource Palette —

To open the Resource Palette, select **SHOW RESOURCE PALETTE** from the Palettes submenu in the Windows menu, or click the Resource Palette's hide/show button in the Button Bar.

If the Resource Palette is open when you quit StudioPro, it will be open the next time you launch the application.

You can display the Resource Palette in several different ways: condensed to dis-

play only those resources that are currently loaded in your model; fully expanded to display the entire library of resources available, as well as those already loaded; or collapsed to display the folder tabs only.

When viewed in its condensed form, the palette displays only those resources that are currently loaded in your model. If there aren't any resources in your model, the preview area of the palette will remain empty until resources are loaded.

Use the *Library* button in the lower left corner of the palette to toggle between the condensed and expanded forms of the Resource Palette.

The condensed palette contains only those resources that are associated with the active model. If more than one model is open at a time, the contents of the palette change depending on which model is active.

Even though a resource may be loaded in the model (into RAM), it does not necessarily mean it is being used in the model. You can remove any unused or unwanted resources through the Plus menu in the upper right corner of the Resource Palette.

If the library portion of the palette contains more folder tabs than fit in the available space, you can use the left or right arrows to scroll through them. You can also increase the width of the palette with the Resize box.

To reduce the size of the Resource Palette even further to display only the folder tabs, select the **COLLAPSE PALETTE** command from the Plus menu.

Once collapsed, the command name changes to **EXPAND PALETTE**.

Several standard Macintosh controls can be found on the Resource Palette:

• **Title bar** – Grab the title bar to position the palette anywhere on the desktop. StudioPro remembers the position of the palette; the next time you launch the application, the Resource Palette appears in the same position as when you quit the current session.

• **Close box** – Click the Close box to close the Resource Palette. This is the same as selecting the **HIDE RESOURCE PALETTE** command from the Windows menu.

• **Resize box** – Use this button to manually set the width of the palette on the screen. You can drag the Resize control horizontally only.

The left side of the palette contains controls that are context sensitive and may change depending on which tab is active.

• **New** – This button allows you to create new resources for the active tab. All new resources appear on the palette.

Anytime you create a new resource, it immediately appears on the palette and becomes part of the model. You can also save any resources you create to their appropriate folders so they will be available for use in other models.

- **Edit** – You can edit any existing resources to meet your needs. If the resource you select to edit is not already loaded, it automatically loads at this time.

- **Apply** or **Insert** – Use this button to apply or insert the selected resource into your model. You can also drag-and-drop resources from the palette into the modeling window.

- **Import** – You can import resources from other sources to use in your model.

The Resource Palette also contains the following specialized controls that pertain to any of the tabs:

- **Library button** – This portion of the Resource Palette contains all resources available for use in your model.

- **Pop-up Resource List** – All available resources are listed in this pop-up list. Resources contained in the library appear above the line; loaded resources appear below the line.

You can select a resource from the upper portion of this list, even when the palette is not expanded to display the contents of the Library. The name of the selected resource appears in the pop-up field. To load the resource, you must *Insert, Apply,* or *Edit* it. You must have an object selected before applying

a resource; if no object is selected, this button is dimmed.

NOTE *If you're already familiar with the resources in the library, you might want to load them in this manner to save desktop space. You won't need to expand the palette to include individual previews of the resources in the library.*

- **Scroll bar** – Use this control to scroll horizontally in the palette to view all the textures loaded in the current model. The scroll bar is active only if there are more textures than can be represented in the view.

- **Preview area** – This area contains a preview image for each resource, if available.

Plus Menu

The Plus menu contains commands that deal with the active tab.

COLLAPSE PALETTE. Select this command to collapse the palette to display only the folder tabs.

Once collapsed, the command name changes to **EXPAND PALETTE**.

NEW. Use this command to create a new resource for the active model.

SAVE. Use this command to save the selected resource to a disk or the hard drive so it can be accessed later for use in other models.

DELETE SELECTED. Use this command to delete the selected resource from the active model. This command does not delete the resource from the hard drive. However, if the resource was created in the current model and never saved with the **SAVE** command, once it is deleted from the model, you won't have access to it again.

DELETE UNUSED. Use this command to remove all of the unused resources on the active tab from the model. This reduces the amount of memory required for the active model.

INSERT/APPLY. Use this command to insert or apply the resource selected from the command's sub-menu.

EDIT. Select a resource from the sub-menu to edit. If the resource is not already loaded, it loads at this time.

HIDE. Use this command to hide the resource you select. When hidden, a check appears beside its name in the pop-up list. To unhide the resource, select it again to remove the check mark.

Handling Resources

The tabs on the upper portion of the Resource Palette represent folders found in the *Libraries* folder within the *Strata StudioPro™* folder at the time you launch the application. You may not add additional folders at this level; only those folders that are shipped with and recognized by StudioPro will appear on the upper section of this palette. (Third party extensions or additional extensions provided by Strata may provide additional tabs/folders later.) You may need to use the left or right arrows to scroll through the tabs if more folders are present than fit in the available space. You may also increase the width of the palette with the Resize box.

These first-level folders found in the Libraries folder appear as tabs on the Resource Palette.
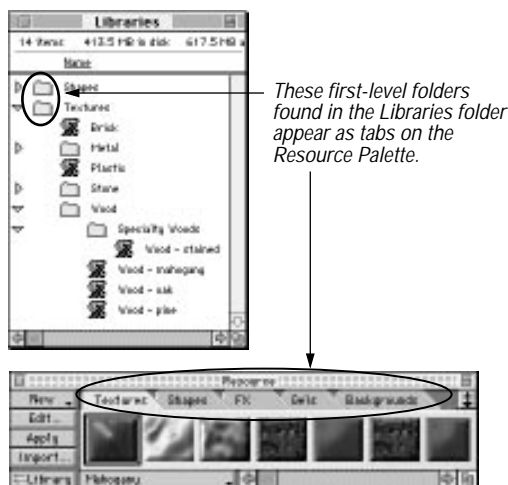
All second level folders appear as tabs in the Library of the active tab. For example, if *Textures* is the active tab, all folders contained in the Textures folder appear as tabs in the Textures library. Any individual files (files not contained within other folders) in the Textures folder will appear in a folder tab labeled according to the name of

the folder in which they're found; in this case, *Textures*.

All second-level folders appear as folder tabs in the Library of the active tab.

All files not contained within a folder are grouped together and placed in a tab labeled "Textures"
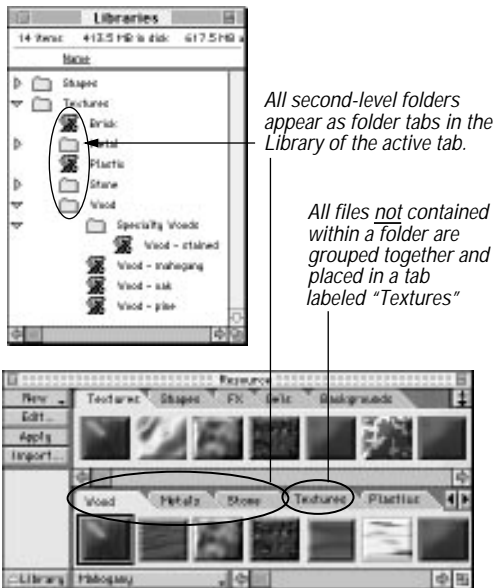
All third-level folders are completely ignored. Texture previews appear side by side, regardless of how deeply they are nested within other folders. In the previous example, *Wood–Mahogany, Wood–Oak, Wood–Pine*, and *Wood–stained* all reside side by side in the Preview area of the Textures library when the *Wood* tab is active, even though *Wood–stained* is located within another folder.

You can create sub-category tabs for the library (lower) section of the palette. Create a folder for the sub-category (second level) folder. Then place the folder into one of the first-level folders in the *Libraries* folder.

For example, you might want to create a folder that contains only fabric textures.

Create a folder named *Fabric* and place it inside the *Textures* folder within the *Libraries* folder. (The *Libraries* folder can be found in the *Strata StudioPro™* folder.)

Place the new folder into the Textures folder within the Libraries folder.
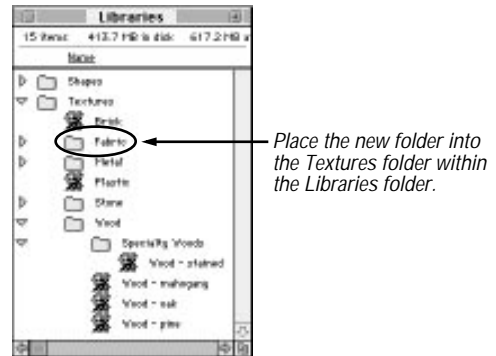
Then place the individual fabric textures into the folder. The next time you launch StudioPro, a tab labeled *Fabric* appears in the Textures library along with *Wood*, *Stone*, *Metal*, etc.

The Fabric tab now appears in the Textures library. When the Fabric tab is active, the texture files found in the Fabric folder appear in the preview area.

TEXTURES

Click the *Textures* tab to make it the active tab. You can create a new texture, edit an existing texture, or apply a texture to an object from the Resource Palette while this tab is active.

The top portion of the *Textures* tab displays all of the textures that are loaded into the active model. If no textures have been loaded into the model yet, the preview area remains blank.
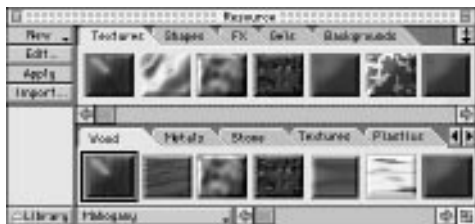
When expanded, the bottom portion of the palette displays the Textures library and includes all textures available for use in the model.

Once a texture is created, it remains part of the model even if you never apply it to any object. The new texture is saved with your model.

LOADING TEXTURES FROM THE LIBRARY

You can add new textures to your model by loading them from the Library section of the palette. Click the *Library* button to expand the palette to display all of the textures available for use in your model. For information on loading textures from other sources, *see* **Importing Textures** *on page 159.*

Use the scroll bar at the bottom of the palette to view the entire contents of the library. You can also adjust the width of the palette by using the Resize box in the lower right corner of the palette.

Textures can also be added to your model by selecting them from the pop-up list to the left of the scroll bar.

Entries above the line let you load resources from the library. The contents of each folder appear in a sub-menu beside the folder name in the pop-up list. Resources that are already loaded into the active model appear at the bottom of the list (below the line).

You can also load a texture from the library into your model in following ways:

• Click once on the texture to select it, then click the *Apply* button. If the texture isn't already loaded, it loads the texture first, and then applies it to the selected object.

• Click-and-drag the texture preview from the Resource Palette to an object in the modeling window. When the object highlights, release the mouse button. This process loads and applies the texture.

• Select a texture from the palette and click the *Edit* button. This loads the texture, if it isn't already loaded, and opens the appropriate *Texture Editing* dialog. Double-clicking on a texture preview also loads the texture and opens the *Texture Editing* dialog.

CREATING SURFACE TEXTURES

StudioPro uses two different types of textures that are applied to the surface of an object.

- *Simple Color* textures let you specify a color to apply to the surface.
- *Surface* textures utilize surface mapping to enhance the realism of renderings. When used properly, textures created with surface maps can be used to simulate actual geometry and may greatly reduce the amount of modeling required to achieve the same results.

To create either of these textures, click the *New* button. When you hold down this button, a list of all available texture extensions appears.

```
Simple Color
Surface Texture
Marble Texture
Stone Texture
Wood Texture
```

The first two entries are used for creating surface textures. You can choose to create either a *Simple Color* texture, or a *Surface Texture*.

Simple Color Textures

This dialog allows you to create a *Simple Color* texture. This type of texture requires less memory than a *Surface* texture.

Edit at. Select *Current Time, All Time,* or *Custom.* If you select *Custom,* enter the time at which you want these settings to take effect for this texture.

Texture Name. This field contains the name of the new texture. This is the name the texture will be cataloged under in the texture list.

Copy texture from. This field allows you to copy the settings from another texture to create a variation for a new texture. Simply choose the desired texture from the pop-up list. (Only textures that are already loaded in your model are listed here.) All settings from that texture are applied to the new texture. The original texture is unaffected.

Color. When you click this button, the Apple Color Picker appears, allowing you to select a color for the texture. When you apply the texture to an object, the entire surface of the object is tinted this color.

Clear slider. This slider determines how opaque or transparent the texture appears.

Preview. This area allows you to see how the texture will appear when rendered. A pop-up list directly below the preview area lets you select the type of preview used. You can choose to view the texture on a sphere, a cube, a cylinder, or on a representation of the object that's selected in the Modeling window. Choosing to preview the texture on a complex object will significantly increase the time required to render the preview.

Click the camera icon to render a preview of the texture. This allows you to see what the texture looks like with the current settings.

Surface Textures

The *Surface Texture* dialog allows you to control every aspect of the textures you create.

The fields in the basic dialog are as follows:

Edit at. Select *Current Time*, *All Time*, or *Custom*. If you select *Custom*, enter the time at which you want these settings to take effect for this texture. You can create textures that change over time by changing the settings in this dialog at different points in time.

Texture Name. This field contains the name of the new texture. This is the name the texture is cataloged under in the texture list. You should use a descriptive name that adequately represents the texture.

Copy texture from. This field allows you to copy the settings from another texture to create a variation for a new texture. Simply choose the desired texture from the pop-up list. (Only textures that are already loaded in your model are listed here.) All settings from that texture are applied to the new texture; the original texture is unaffected.

Color. When you click this button, the Apple Color Picker appears, allowing you to select a color to apply to the texture. When you apply the texture to an object, the entire surface of the object is tinted this color. If the texture you create also con-

tains a color map, all of the colors present in the map are tinted this color, as well.

Map. Use this field to add an image to use as a color map for your texture. When the *Map* button is clicked, the *Image Map* dialog appears. This dialog provides you with various options for manipulating the map.
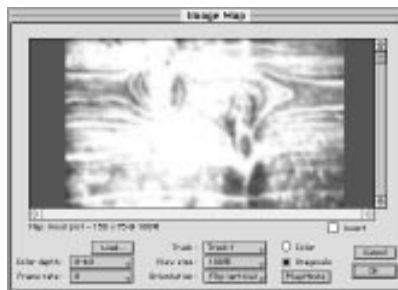
- **Load**. This button allows you to load an image or movie to use as a map in the texture definition. You can load any format supported by StudioPro. This includes PICT, TIFF, Targa, and JPEG formats for single frames. Acceptable animation formats include QuickTime movie, or sequentially numbered PICT, TIFF, Targa, or JPEG images.

- **Color depth**. This field allows you to select a color-depth for the image or animation from the pop-up list. Reducing the color depth can save memory. A color map stored as a 32-bit image requires four times more memory than an eight-bit color map. However, once you change the color depth, you'll need to re-load the map to revert to its original color depth.

- **Frame rate**. This field allows you to select a frame rate for a movie. This field is not available if no movie is present.

- **Track**. This field lists all tracks in the current movie. If no movie is present, this field is not available.

- **View size, Orientation**. You can set the view size and the orientation of the map in these fields.

- **Color/Grayscale**. You can convert the map to grayscale in this dialog.

- **Play Movie**. This button displays the animation playback window and plays the QuickTime movie specified in the *Map* field. This button is available only for QuickTime movies; the animation playback window doesn't support sequentially numbered images. However, sequentially numbered PICT, Targa, and JPEG images are acceptable formats for use as texture maps, even though they can't be viewed from this dialog.

- **Invert**. The *Invert* check box is used to invert the map. This feature can be very useful in several situations. Perhaps you want the light areas of the map to become the depressions in the surface rather than the high areas. You can simply invert the grayscale map and use it as the new bump map.

Gloss slider. This slider determines how shiny the texture appears by controlling the amount of ambient and diffuse light reflected, the amount of specular light reflected, the amount of reflectivity, and the smoothness of the texture.

Clear slider. This slider determines how opaque or transparent the texture appears by controlling the level of opacity, and the amount of ambient and diffuse light reflected.

Preview. This area allows you to see how the texture will appear when rendered. A pop-up list directly below the preview area lets you select the type of preview used. You can choose to view the texture on a sphere, a cube, a cylinder, or on a representation of the object that's selected in the modeling window. Choosing to preview the texture on a complex object will significantly increase the time required to render the preview.

Click the camera icon to render a preview of the texture. This allows you to see what the texture looks like with the current settings.

Expert button. Although you can create custom textures from the basic *Surface Texture* dialog, the *Expert* settings let you create textures that look more realistic.

To expand the *Surface Texture* dialog to display additional controls, click the *Expert* button in the lower left corner. This expanded palette allows you finer control over the surface properties of the texture.
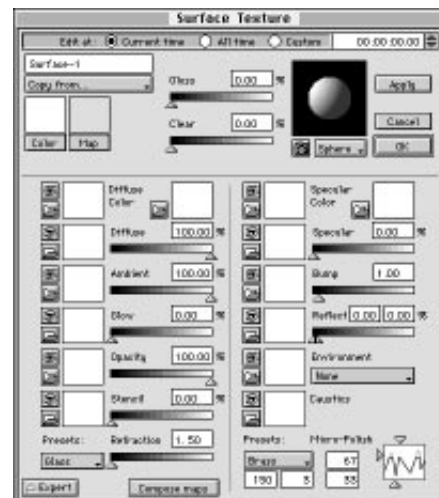
You can add dimension and realism to your images by using surface maps to define your textures. A surface map is an image or animation that's used to define the surface of an object.

Each surface property field contains two icons which allow you to control any of the surface maps contained in your texture.

To load a map, click the folder icon. The *Image Map* dialog appears. You can load any PICT, TIFF, Targa, JPEG, or QuickTime image or animation. This dialog offers various controls for converting your color maps to grayscale and inverting maps for use as opacity or bump maps, for example.

It's quite common to use the same grayscale map, or an inverse of it, in several map fields. Typically, these maps are created from the same master image. That way, they are guaranteed to align correctly.

Use the "eye" icon to turn any field on or off. If you turn off a particular field and there is a texture below, the settings for that texture's field will be seen.

Each surface property field also allows you to specify a value which controls the total effect each map has on the final texture. You can enter this value numerically or use the slider. In this manner, you can make subtle changes to the various surface properties without the need to change the surface maps themselves.

For example, perhaps the grayscale map in the *Reflectivity* field creates a texture that reflects slightly more light than you want. Instead of taking the map back into an image-processing application and

toning down the grayscale values, you can simply reduce the value from 100 percent to 90 percent.

If a field contains no map, the values specified by the slider become global settings for the texture. For example, if the *Reflectivity* field contains no map and the slider is set to 90 percent, the texture will reflect 90 percent of the light hitting the surface.

Refraction and *Micro-Polish* have no maps; therefore, the settings for these fields are always global in nature and apply to the overall texture.

Diffuse Color, *Specular Color, Environment*, and *Caustics* are the only fields that contain maps that use color information. All of the other maps are treated as grayscale maps. The value of each pixel in the map determines the level of effect for that particular surface property for that pixel in the final rendered image.

The following surface properties fields appear in the *Surface Texture* dialog:

Diffuse Color Map. *Diffuse Color Map* and *Diffuse Color* can both be set from the basic *Surface Texture* dialog (upper portion).

- **Diffuse Color Map.** Diffuse color maps are the main method of putting color images on objects. They are visible when diffuse light reflects off the surface. This is the same as the *Map* field in the upper portion of the dialog.

- **Diffuse Color preview**. The preview to the right of the *Diffuse Color Map* field displays the color of the diffuse light. The entire object is tinted this color. This is the same as the color in the preview directly above the *Color* button in the upper portion of the dialog.

Diffuse. Diffuse light is light that scatters in all directions. Surfaces with a lot of diffuse reflection appear dull or matte.

HIGH   *MEDIUM*   *LOW*

- **Diffuse Map**. This grayscale map controls how much diffuse light is reflected from the surface of an object, based on the pattern in the map. Black areas of the map prevent any light from being reflected, white areas allow full diffuse light reflected (according to the value set by the *Diffuse* slider), and gray areas suppress the light reflected depending on the level of gray.

- **Diffuse Value**. The slider in this field specifies the percentage of the total light which is reflected from the surface of an object. It is diffuse in nature. If you wish, you can enter a value in the numeric entry field directly above the slider instead of using the slider. The range for this field is from 0 to 100 percent. A setting of zero means no diffuse light is reflected; a setting of 100 percent means all of the diffuse light is reflected, based on the values indicated by the map.

Ambient. Ambient light is non-directional background lighting.

HIGH   *MEDIUM*   *LOW*
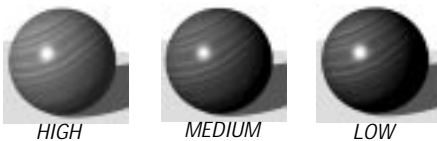
Notice that the lower the Ambient Fraction setting, the higher the contrast in the shaded areas of an object. The un-lit side is almost black in the image with a low ambient fraction.

- **Ambient Map**. You can load a grayscale map in this field by clicking the folder icon. This map controls the amount of ambient light reflecting from the surface of an object. Black areas of the map reflect no ambient light; gray areas reflect varying degrees of ambient light, depending on the level of gray; white areas reflect all of the ambient light present, based on the setting of the *Ambient* slider.

- **Ambient Value**. The setting here determines how much of the ambient light the surface reflects. The range for this field is 0 to 100 percent. A setting of zero percent means the surface will reflect no light and will be very dark (or black) in the shadows; a setting of 100 percent reflects all light striking the surface, based on the pattern of the *Ambient* map.

Glow. Glow determines the amount of luminescence a surface emits, without reflecting light from an outside surface. The renderers can't detect backlighting, but you can use this field to simulate the glow of a surface that is illuminated from behind. The color of the glowing surface is determined by the color set in the texture, not the color of the light falling on the object.

With Glow, you can create objects that appear to emit light.

- **Glow Map**. This grayscale map determines where, and how much, glow occurs on the surface of an object, based on the pattern in this map. White areas are areas with the highest

amount of glow, grays with areas of less glow (depending on the level of gray), and black areas are areas with no glow at all. The maximum glow is determined by the *Glow* value.

- **Glow Value**. Use this field to control the amount of glow emitted from the surface of the object. A value of zero produces no glow at all; a value of one overpowers any other surface characteristics of this texture.

Opacity. Opacity describes the texture's ability to prevent light from passing through it. If you're creating a transparent texture, remember to lower the amounts of ambient and diffuse light, as well.

- **Opacity Map**. Grayscale opacity maps specify areas on a surface that are opaque. You can use opacity maps to give the illusion of geometry that is entirely different than the actual object. You can create holes in objects or add features that don't exist, such as doorways, windows, or holes in the surface of any object.
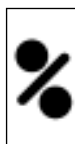
When an opacity map is used in a texture definition, it can create an illusion of holes in the surface of the object to which it's applied.

The white areas of the map correspond to areas that are fully opaque, gray areas are semi-opaque according to the level of gray, and black areas corre-

spond to fully transparent areas, according to the *Value* setting for *Opacity*.

When using *Opacity* maps to create holes in objects, you must also suppress the amount of ambient, diffuse and specular light that would normally reflect from the surface. This requires that you use maps in these fields also.

- **Opacity Value**. Use this field to set the amount of opacity for the surface, based on the values indicated by the grayscale map. Opacity is entered as a value between 0 and 100 percent. A value of 100 percent results in a fully opaque surface. A value of zero is fully transparent and therefore invisible, except for its effect on the objects behind it, such as color and refraction. However, fully transparent objects can also have ambient and diffuse values which cause the surface to become visible, and if set too high, can obscure the objects behind it.

NOTE *Using the* Clear *slider in the upper portion of the dialog automatically reduces these surface properties accordingly.*

Stencil. This field allows you to use only a specific portion of the texture definition.

- **Stencil Map**. This grayscale map defines the area of the surface map to use in the texture definition. Black areas of the map do not exist, and the texture below shows through. White areas define the areas of the surface texture that are used. Gray areas of the texture

mix with the texture below, according to the level of gray.

Stencil Map

Black areas do not exist in the texture definition.

White areas define the portion of the surface map that will use only <u>this</u> texture's settings in each channel.

Gray areas will mix values in all channels with the values in the texture below.

Do not confuse *Stencil* with *Opacity*; *Stencil* affects all channels of the texture, not just the opacity channel.

• **Stencil Value**. This field indicates the value used to scale the Stencil map. If no map is present, this setting determines to what degree the texture below shows through.

Refraction. This field is used to control the amount of refraction visible through a transparent surface. Refraction causes light to bend whenever it travels through one medium to another, such as from air through glass through water and back to air. Refraction is apparent on solid, single-sided objects only.
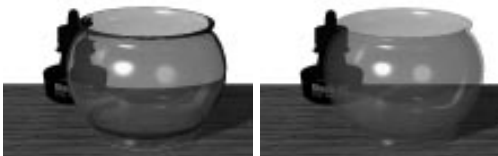
With refraction   *No refraction*

Notice how the light seems to bend as it passes through the bowl on the left.

Refraction is used to simulate curved or transparent surfaces such as flat glass, lenses, crystal, gems, etc.

• **Presets**: You can select a refraction index from a pop-up list of common materials. The slider updates to reflect your selection.

• **Refraction Value**: A value of one is equivalent to the refraction index of air. *See page 263* for a table of the more common materials and their indexes of refraction.

   In reality, the color (or wavelength) of the light determines the angle at which light is refracted. StudioPro does not consider wavelength, and therefore an average index of refraction is used. All colors are refracted the same amount; therefore, prismatic effects are not generated.

Specular Color Map. A specular color map allows you to have pixel-by-pixel color control of the highlight that reflects from the surface of an object.

• **Specular Color Map**. This map is a color map. It controls the specular light reflected from the surface of an object based on the pattern in the map.

• **Specular Color preview**. You can tint the entire specular color map. Click on the preview to display the system's color picker, and select a color to use to tint the map.

Specular. Specular light is the highlight that reflects from the surface of an object.

HIGH   *MEDIUM*   *LOW*

- **Specular Map**. A specular map is a grayscale map that allows you to create surfaces that vary in their gloss or shininess. Black areas of the map reflect no specular light; grays reflect varying amounts depending on the level of gray; and white areas reflect the most specular light, according to the value set by the slider or the value in the numeric field above the slider. When used properly in conjunction with reflectivity maps, you can accurately simulate all types of surfaces, such as metals, plastics, glass, paper, paint, etc.

- **Specular Value**. Use this field to control the effect of the grayscale *Specular Map.* Enter a value from 0 to 100 percent.

Reflectivity. This field determines the level of mirror-like reflection a surface has. For a perfectly reflective surface, use no *Ambient* or *Diffuse*, but set full *Reflectivity* and *Opacity*. However, very few surfaces, except mirrors, are perfectly uniform in their reflectivity. You can create more realistic-looking shiny objects by using a surface map to define the variations in the reflectivity of the surface. The color displayed in the *Specular Color* preview determines the color of the reflected light.

- **Reflectivity Map**. A reflectivity map uses a grayscale image to vary the level of reflectivity on the surface of an object, according to the value specified by the *Reflectivity* slider. White corresponds to the most reflective areas, gray areas vary according to the level of gray, and black produces no reflectivity at all.

- **Minimum Reflectivity Value**. This value controls the intensity of the light that reflects perpendicular to the viewing plane.

- **Maximum Reflectivity Value**. This value controls the intensity of the light that reflects at nearly parallel angles to the viewing plane.

Minimum Reflectivity

Maximum Reflectivity
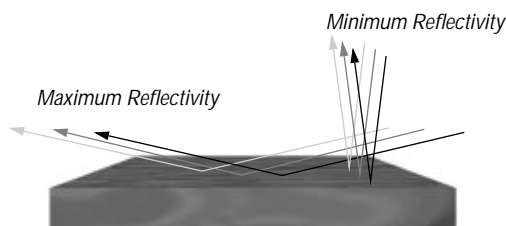
For example, compare the way light reflects off the surface of water in a lake. When you look directly into the water, it doesn't reflect much light. This is equivalent to minimum reflectivity. When you look at the surface of the water at an angle, it takes on a mirror-like appearance and reflects far more light.

Environment. Environments add surrounding reflections to the objects in your models. This field allows you to build a reflective background into your texture to control the reflections that appear in shiny surfaces.

- **Environment Map**. You can load an image or animation file into this field. The image or animation determines the reflections that appear on objects with shiny or reflective surfaces.

- **Environment pop-up menu**. You can also build a reflective environment into

a texture by selecting one from the *Environment* pop-up list.

All backgrounds currently loaded in the active model appear in the upper section, and those available in the *Backgrounds* library appear in the lower section. Select *None* to remove the existing reflective background.

Bump. This field allows you to create objects that seem to have uneven surfaces, even though the geometry isn't altered in any way. To the renderer, the object appears to have high areas and depressions.
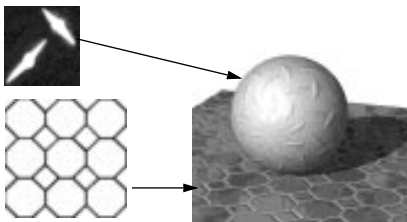
White areas in bump map create raised areas on ball. Dark areas in ceramic tile's bump map create depressions in the floor for seams in the tiles.

• **Bump Map**. White areas of the map indicate areas of raised height; dark areas indicate depressions in the surface.

Bump mapping works with surface normals. A surface normal is the direction the surface is facing, which, in turn, determines the direction which light reflects from an object. It doesn't alter the geometry of the object; bump maps just change the direction the surface normals are facing.

Because bump mapping works with surface normals, this map requires transitional grays between the white (high) and black (low) areas of the map to determine how deep the depression appears. This is extremely important. If your bump map contains only white and black, the appearance of the surface of your object won't change. However, you can simply blur the bump map in an image processing application, such as Adobe's PhotoShop™, before you load it into the *Bump Map* field of the texture.
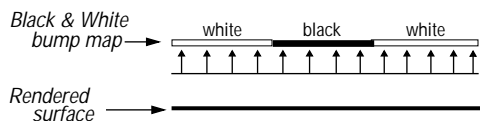
B&W image for bump map (no gradation) – Normals are unaffected by the bump map.
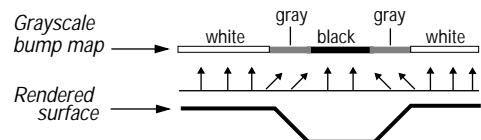
Grayscale image for bump map (w/ gradation) – Normals are deflected by the bump map, and the surface appears with depressions because of variations in lighting intensity.

A sudden change from white to black, with no gradient between the two, will not register as a surface depression.

• **Bump Value**. The *Bump* field must have a bump map to have any effect on the surface. It sets the depth of surface variations specified by the bump map field. The higher the value, the deeper the depressions appear. If no bump map is present, this setting has no effect.

Caustics. Caustics affect the light as it passes through an object. Therefore, the caustic effect is not apparent on the object to which it is applied; it is only visible on the objects behind an object with a caustics map in its texture definition. For this field to have any apparent effect, the texture must have some degree of transparency as well. An example of this effect is the way light is affected as it passes through the water in a swimming pool, creating patterns of light and dark on the bottom of the pool.

• **Caustics Map**. A grayscale or color image or animation is used to define the way this texture affects the light that passes through it. This pattern doesn't appear on objects to which this texture is applied, but only on the objects that are behind or below.

Micro-Polish. The smoothness of a surface affects the way light reflects from it. Micro-polish settings determine the smoothness of an object on a microscopic scale. Metallic surfaces have a high degree of specularity and the hot spots tend to have halos around them. Micro-polish allows you to simulate this "halo" effect.

StudioPro provides a variety of preset values for various materials. You can select a preset from the pop-up list, or you can modify one to meet your needs. You

can also use the interactive *Micro-polish* controls or enter values directly in the numeric fields below.

This control determines the ANGLE at which the irregularities are removed when polished. (Second Weight %)

This control determines the LEVEL at which the irregularities are removed when polished. (Second Smoothness)

This control determines the coarseness of the irregularities in the surface. (First Smoothness)

First smoothness
Second smoothness

1st Weight %
2nd Weight %

• **First Smoothness** (lever on bottom). This field defines the overall smoothness of the surface of the object.

• **First Weight** %. There is no lever for interactively defining this field. The default value in the *First Weight %* field is an inverse function of the *Second Weight %*. However, you can enter a value in this field without affecting the value in *Second Weight %* field.

• **Second Smoothness** (lever on side). This field is provided primarily for creating metallic textures. It determines the level at which irregularities are removed from the surface when polished.

- **Second Weight %** (lever on top). The value in this field determines how much the coarseness of the material affects the way in which it's polished.

Compose Maps. This button allows you to align the individual maps in the texture definition to the orientation required to create the desired affect. When you click this button, a dialog is displayed that allows you to position individual maps in any orientation.
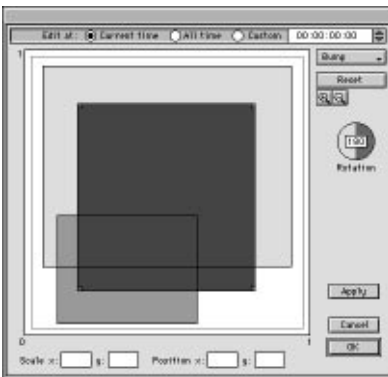
- **Edit At**. Select *Current Time*, *All Time*, or *Custom*. If you select *Custom*, enter the time at which you want these settings to take effect for this texture.

- **Map**. This pop-up list contains all of the maps in the current texture definition. Select the map from the list that you want to position.

- **Editing window**. You can grab the representation of the selected map in the editing window and move it to any position. To rotate the map, use the

interactive *Rotation* control to the right of the editing window.

Select a map from the pop-up list. All maps contained in the texture appear in this list.

You can also rotate the selected texture with this control
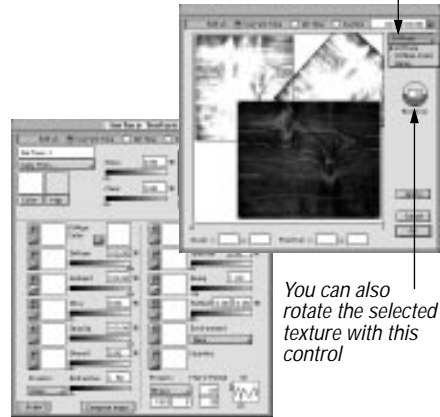
- **Reset**. If you're unhappy with the placement and want to revert to its original position, click the *Reset* button.

Apply/Cancel/OK buttons. If you want the position of the individual maps to change over time, click the *Apply* button, then you can change the time in the *Custom* field at the top of the dialog and re-align the maps. You can repeat this procedure as often as desired. When you're finished defining the new texture, click the *OK* button to load the texture into the current model. The texture becomes part of your model and appears in the "loaded" portion of the *Textures* tab on the Resource Palette. It will be saved with the active model. If you want to save this texture for use in other models, select the **SAVE...** command from the Plus menu on the Resource Palette.

You can also choose to discard entries in this dialog by clicking the *Cancel* button.

CREATING SOLID TEXTURES

Solid textures are volumetric in nature. When you apply a solid texture to an object, it seems to be carved out of a three-dimensional volume. For instance, when a *Wood* texture is applied to an object, it appears as though the object was carved from a solid block of wood.
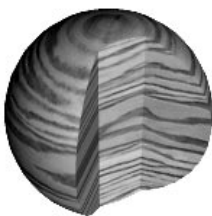
Solid textures render faster than surface textures. However, they do not give you the same pixel-by-pixel control as surface maps. Surface properties settings in a solid texture are global in their effect.

Several solid textures are shipped with the software. You can load them into your model from the texture library, and modify them, if desired.

You can also create your own solid textures with StudioPro. They can be saved and used in other models. Each type of solid texture requires a special texture extension to generate its texture pattern. Each extension has its own texture dialog.

To create a solid texture, hold down the *New* button. A list of the available texture extensions is displayed. The following

solid texture extensions are included with StudioPro:

Marble

The *Marble* texture dialog lets you create your own unique marble textures.
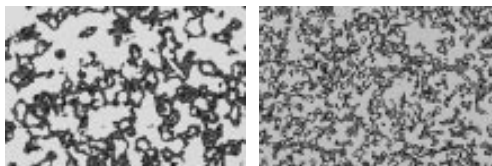
You can create a marble texture using only the fields found in the condensed version of the *Marble* dialog.

The *Marble* dialog, in its condensed mode, contains the following fields:

Edit at. Select *Current Time*, *All Time*, or *Custom*. If you select *Custom*, enter the time at which you want these settings to take effect for this texture.

Name. This field allows you to name your new texture. A default name is provided, but you can change the name of the texture at any time.

Copy from. This field allows you to copy the settings from another marble texture to create a variation for a new marble. Choose an existing marble texture from the pop-up list. (Only textures that are already loaded in your model are listed

here.) All settings from that texture are applied to the new texture. The original texture is unaffected.

Main. This button displays the Apple Color Picker, from which you can select a color to use as the main color, or background, of the marble texture.

Body. This button lets you select a color to use for the body of the vein.

Edge. This field allows you to specify a color for the edge of the vein.

Gloss slider. This slider controls how shiny the surface of the marble appears by controlling the amount of ambient, diffuse, and specular light that is reflected, the level of reflectivity, and the smoothness of the texture.

Clear slider. This slider determines how opaque or transparent the marble appears by controlling the level of opacity, and the amount of ambient and diffuse light that is reflected.

Preview. Select the object type to use for previewing your texture. You can choose from a cube, sphere, or cylinder, or use the selected object in the modeling window for the preview. However, the more complex the object, the more time required to render the preview.

Click the camera icon to render a preview of the texture. This allows you to see what the texture looks like with the current settings.

Expert button. If you want more precise control over the surface properties of the

texture, click the *Expert* button to expand the dialog.
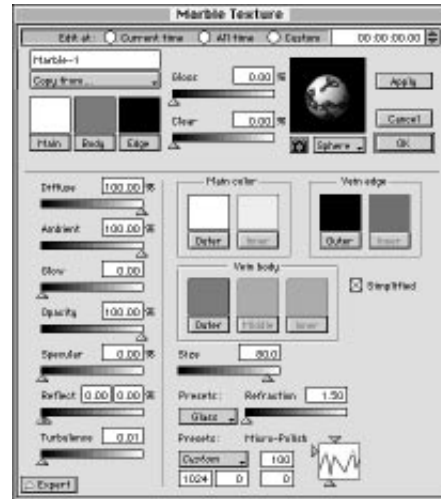
The expanded dialog contains additional settings. Values obtained by using the sliders produce the best results; however, you may enter values in the numeric input fields above the sliders that exceed those values represented by the slider.

The surface property fields on the left allow you to either use the slider or enter a value in the numeric input field. This value overrides the values determined by the sliders in the upper portion of the dialog. For more complete descriptions of these fields, see *page 143*.

Diffuse. The setting in this field determines the total amount of diffuse light reflected from the surface of an object.

Ambient. This field indicates how much of the ambient light is reflected from the surface.

Glow. Glow determines the amount of luminescence a surface emits. A value of zero produces no glow at all.

Opacity. This field determines the texture's ability to prevent light from passing through it. A value of zero represents full transparency; 100 full opacity. If you're creating a transparent texture, lower the amounts of ambient and diffuse light also.

Specular. This field determines the amount of specular light reflected from the surface.

Reflectivity. This field controls the amount of light reflected from the surface of an object. You can specify a minimum and maximum value for this field. The minimum value represents the amount of light reflected when the object is viewed at an angle perpendicular to its surface. The maximum value indicates the amount of light reflected when viewed from a nearly parallel angle to its surface.

Turbulence. This slider defines the turbulence of the vein.

Main color. *Outer* color is the main color, or background, of the marble surface. *Inner* color is the color of any areas completely contained within the vein.

Vein edge. This field is used to specify two different colors for the edges of the veins: *Outer* color and *Inner* color.

Vein body. This field is used to select three different colors, or gradations of a single color, for the body of the vein.

Simplified scheme. When this box is checked, only the *Outer* color selections

are used in the texture definition (*Outer* Main color, *Outer* Vein edge, *Outer* Vein body). These are the colors that appear in the upper portion of the dialog. Also, when this box is checked, you can't edit any of the colors that don't apply (*Middle* or *Inner* colors).

Size. The value in this field represents the overall size of the marble texture.

Refraction. You can use the slider, enter a value in the numeric input field, or select from one of the presets in the pop-up list.

Micro-Polish. You can adjust this field manually, or use one of the settings from the pop-up list of presets. *See page 150* for a complete description of this field.

Wood

The *Wood* texture extension lets you create custom wood textures to use in your models.
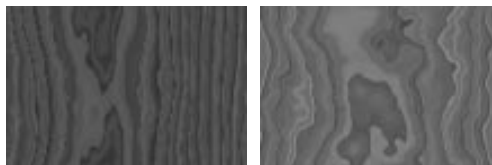
You can create an endless variety of wood patterns by adjusting the settings in the *Wood* dialog.
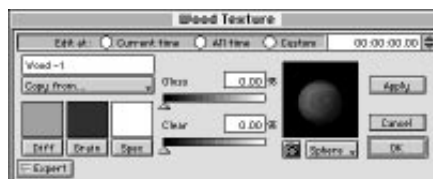
In its condensed form, the *Wood* dialog contains the following fields:

Edit at. Select *Current Time, All Time,* or *Custom.* If you select *Custom,* enter the time at which you want these settings to take effect for this texture.

Name. This field allows you to name your new wood texture.

Copy from. This field allows you to copy the settings from another wood texture to create a variation for a new texture. Only wood textures that are already loaded in your model are listed here. Choose one from the pop-up list. All settings from that texture are applied to the new texture. The original texture is unaffected.

Diffuse (Diff). This field defines a color for the diffuse light reflected from the surface of the object.

Grain. This field defines a color for the grain of the wood.

Spec. This field defines a color for the specular light that's reflected from the surface of the wood.

Gloss slider. This slider defines how shiny the surface of the wood appears. It controls the amount of ambient, diffuse, and specular light reflected, as well as the level of reflectivity and the smoothness of the wood.

Clear slider. This slider specifies the level of opacity of the wood texture. It controls the opacity, ambient, and diffuse surface properties of the wood.

Preview. From the pop-up list you can select an object type to use for previewing

the texture. The more complex the object you use for the preview, the more time required to render the preview.

Click the camera icon to render a preview of the texture. This allows you to see what the texture looks like with the current settings.

If you want even greater control over the surface properties of the wood, click the *Expert* button to expand the dialog.
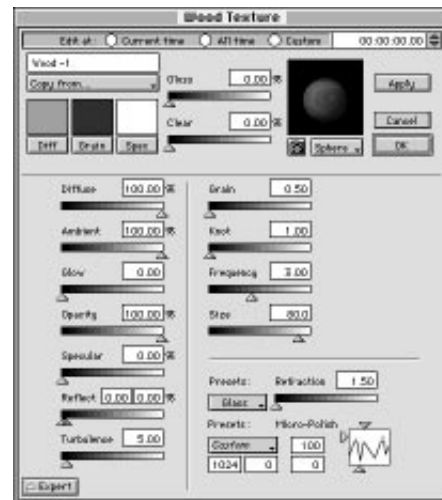
The values in these fields override any values indicated by the *Gloss* and *Opacity* sliders in the upper portion of the dialog. You can use the sliders or enter the values in the numeric input fields directly above the sliders.

Values obtained by using the sliders produce the best results, but in many cases you may enter values outside the range of the slider directly in the numeric input field. The expert section of the dialog contains the following additional fields:

Diffuse. The setting in this field determines the total amount of diffuse light reflected from the wood.

Ambient. This field specifies how much of the ambient light is reflected from the surface.

Glow. Glow determines the amount of luminescence a surface emits. A value of zero produces no glow at all.

Opacity. This field determines the texture's ability to prevent light from passing through it. A value of zero represents full transparency; 100 represents full opacity. If you're creating a transparent texture, lower the amounts of ambient and diffuse light also.

Specular. This field determines the amount of specular light reflected from the surface.

Reflectivity. This field controls the amount of light reflected from the surface of an object. You can specify a minimum and maximum value for this field.

The minimum value represents the amount of light reflected when the object is viewed at an angle perpendicular to its surface. The maximum value indicates the amount of light reflected when viewed from a nearly parallel angle to its surface.

Turbulence. This value indicates the amount of turbulence present in the wood texture.

Grain. This value represents the amount of variation in the grain.

Knots. This field determines the frequency of the knots in the wood. The higher the value, the more frequently knots appear in the texture.

Frequency. This setting determines the amount of spacing or waviness present in the grain of the wood.

Size. The value in this field represents the overall size of the wood texture definition.

Refraction. Enter a value, or select one of the settings from the *Presets* pop-up list.

Micro-Polish. Adjust *Micro-Polish* manually, or use the settings from one of the presets in the pop-up list. For more information, *see page 150.*

Stone

StudioPro includes a *Stone* texture extension that allows you to make your own stone textures.
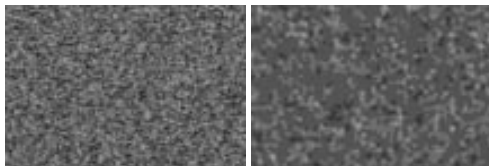
You can change the characteristics of the stone texture by editing the settings in the Stone dialog.

The basic version of the *Stone* dialog contains the following fields:

Edit at. Select *Current Time, All Time*, or *Custom.* If you select *Custom*, enter the time at which you want these settings to take effect for this texture.

Name. This field allows you to enter a name for your new Stone texture that will appear in the Resource Palette.

Copy from. This field allows you to copy the settings from another stone texture to create a variation for a new texture. Simply choose the desired texture from the pop-up list. (Only textures that are already loaded in your model are listed here.) All settings from that texture are applied to the new texture. The original texture is unaffected.

Main. This field defines the color for the main portion, or background, of the stone texture.

Grain. This field defines a color for the grain of the stone.

Spec. This field defines the color of the specular light that reflects from the stone's surface.

Gloss slider. This slider defines how shiny the surface of the stone appears.

Clear slider. This slider defines the texture's level of opacity. This slider also affects the amount of ambient and diffuse light reflected.

Preview. You can select the type of object used for the preview rendering from the pop-up list. Choose from a cube, sphere, or cylinder, or you can use an object that's selected in the modeling window for the preview. Remember, though, the more complex the object you use for the preview, the more time required to render the preview.

Click the camera icon to render a preview of the texture. This allows you to see what the texture looks like with the current settings.

If you want more precise control over the stone's surface properties, click the *Expert* button to expand the dialog.
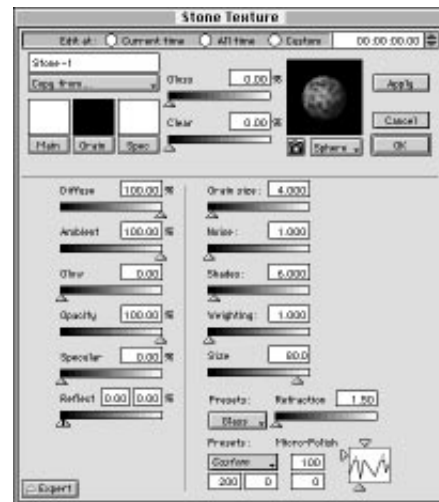
The values in these fields override any previously defined values indicated by the *Gloss* and *Clear* sliders in the upper portion of the dialog.You can use the sliders or enter the values in the numeric input fields directly above the sliders.

For the most realistic-looking stone textures, use values obtained with the sliders. Some fields, however, may accept values outside the range of the slider. The follow-

ing fields are included in this section of the dialog:

Diffuse. The setting in this field determines the total amount of diffuse light that reflects from the surface of the stone.

Ambient. This field specifies how much of the ambient light reflects from the surface.

Glow. Glow determines the amount of luminescence the surface emits. A value of zero produces no glow at all.

Opacity. This field determines the texture's ability to prevent light from passing through it. If you're creating a transparent texture, lower the amounts of ambient and diffuse light also.

Specular. This field determines the amount of specular light reflected from the surface.

Reflectivity. This field controls the amount of light reflected from the surface of the stone. You can specify a minimum and maximum value for this field.

The minimum value represents the amount of light reflected when the object is viewed at an angle perpendicular to its surface. The maximum value indicates the amount of light reflected when viewed from a nearly parallel angle to its surface.

Grain size. This value determines the size of the grains present in the stone texture.

Noise. This field determines how erratic the pattern in the stone appears.

Shades: This field indicates the total number of shades of the specified grain color that are used in the stone texture.

Weighting. This field determines the amount of the grain color used relative to the amount of main color used.

Size. The value in this field represents the overall size of the stone texture definition.

Refraction: Enter the index of refraction, or use the value from one of the presets in the pop-up list.

Micro-Polish: Adjust Micro-Polish settings manually, or use the settings from one of the presets in the pop-up list. For more information, *see page 150.*

EDITING TEXTURES

You can edit any texture on the Resource palette. Click the *Edit* button to edit the selected texture. If the texture you choose is not already in the model, it will automatically load first. If no textures are selected, the *Edit* button is unavailable.

When you click the *Edit* button, the texture dialog for the selected texture appears. You can also double-click on the texture preview. If the texture is not already loaded, it will load and then display the appropriate texture dialog. You can change any of the parameters for the texture definition. See *page 141 - 158* for information on each of the fields in the Texture Editing dialog.

When the *Texture Editing* dialog for the selected texture is displayed, you can rename the texture, if desired. Any time you edit a texture, it's a good idea to change the name of the texture. Then you can use both the edited texture and the original texture in your model.

The edited texture then becomes a part of the current model. You can save edited resources so they can be used later in other models by selecting the **SAVE...** command from the Plus menu on the Resource Palette.

The appearance of a single texture can change over time. When you edit a texture, you can specify the time at which the changes occur. Remember, however, that changes to a specific texture occur on ALL objects to which that texture is applied.

You can also cause the texture to appear to change over time by simply adding another texture at a different time frame. During the transition from one texture to the next, there will be some frames in which the object will actually have both textures.

APPLYING TEXTURES

Click the *Apply* button to apply the selected texture to the selected object(s). If no object is selected, the *Apply* button is dimmed.

You can also use the drag-and-drop method to apply a texture to an object. Select a texture from the Resource Palette, then drag-and-drop that texture onto any object in the modeling window. The object does not have to be previously selected; you can drag-and-drop a texture on ANY object in the modeling window.

SAVING TEXTURES

When you create a new texture, it becomes part of the model and is saved with the model. However, if you want to be able to access the texture for use in another

model, you must save the texture to disk. A **SAVE** command is provided in the Plus menu. *See* **Plus menu**, *below.*

IMPORTING TEXTURES

You can import a texture from another source to use in your model. Only file types recognized by StudioPro will be available with this command.

The Plus Menu

When the *Textures* tab is active, the contents of the Plus menu contain entries that apply to handling textures.

NEW. This command is the same as clicking the *New* button on the left side of the palette. For information on creating a new texture, *see page 141*.

SAVE. When you create a new texture, it automatically becomes part of the current model and is saved with it. You may, however, want to access a texture to use later in other models. An entry in the Plus menu makes this possible.

To save a texture to the Textures library, choose the **SAVE...** command from the Plus menu on the Resource Palette. A dialog appears allowing you to specify a name and the location for the save function. To appear in the library, you must save the texture to the appropriate folder. *See* **Handling Resources** *on page 138* for more information.

DELETE SELECTED. This command does not delete the texture from disk; it only removes it from the model, thus releasing the memory required to store it in your model. However, if you haven't saved the

texture yet and it does not already exist as part of the texture library, it will be permanently lost.

DELETE UNUSED. You can delete all of the textures from the model that are not being used. Removing unnecessary textures decreases the amount of memory required for the model.

If the texture has already been saved using the **SAVE...** command from the Plus menu, this command doesn't delete the textures from your disk, just from the model itself. However, if you haven't saved the texture to disk, once it's deleted from your model, you won't have access to it again.

INSERT/APPLY. Use this command to apply any loaded texture to the selected object. A list of all loaded textures appears in a pop-up list when you select the command from the menu.

EDIT. Use the **EDIT** command to edit any texture that's currently loaded in your model. Choose the texture you want to edit from the **EDIT** sub-menu. This command is the same as clicking the *Edit* button on the *Textures* tab of the Resource Palette.

The appropriate *Texture Editing* dialog appears for the selected texture, allowing you to edit any of the current settings. For a detailed description of each of the fields in the dialog, *see page 141*.

SHAPES

Using shapes makes your modeling more efficient. It requires much less memory to insert multiple instances of a shape than to create the objects over again. Inserting a shape instance requires approximately 20K. This is much less than the memory required to duplicate the object, especially if the object is a complex polygonal mesh.

Using shapes also saves time during rendering because the renderer has to perform a certain amount of processing only once, rather than many times.

Click on the *Shapes* tab to make it the active tab. You can create new shapes, edit existing shapes, insert shapes into the active model, or import shapes from other sources.

All of the currently loaded shapes in the active model appear in the top section of the *Shapes* tab.

To expand the palette to include the Shapes library, click the *Library* button. All shapes available for use in your model appear in the Shapes library.

If more than one model is open, switching between models causes the *Shapes* tab to redraw. Only shapes included in the active model appear in the upper portion of the *Shapes* tab.

LOADING SHAPES FROM THE LIBRARY

You can select shapes from the Shapes library to add to your model. If the Shapes library is not visible, click the *Library* button to expand the palette to display all of the shapes available to you. Use the scroll bar, if necessary, to scroll through the entire collection of shapes. You may also use the Resize box in the lower right corner to change the width of the palette.

The shapes in the library may be sub-divided into categories, with each category represented by a separate folder in the library. To view the contents of a library folder, click on the folder tab.

Shapes can be also be loaded into your model in the following ways:

• Click once on the shape to select it, then click the *Insert* button. This loads the shape, if necessary, and then inserts an instance of the shape into the modeling window.

• Select a shape from the palette and click the *Edit* button. This loads the shape and opens the shape's workspace. This can also be accomplished by double-clicking the shape. Double-clicking a shape is the same as selecting the shape and clicking the *Edit* button.

CREATING SHAPES

Click the *New* button to create a new shape. A *New Shape* dialog appears allow-ing you to name the object and add it to the list of shapes.

The dialog also contains two check boxes. If an object (or group of objects) is selected in the modeling window when you use the **NEW SHAPE** command, both check boxes will be checked. If no objects are selected, both check boxes will be dimmed.

• Include selection

 Any selected objects are included in the new shape and appear in the new shape window. If you don't want the selected object(s) to be included, be sure this check box is unchecked.

• Replace selection

 When an object is converted to a shape, the selected object becomes an instance of the shape.

 If you don't want the original object to be replaced by an instance of the shape, you must uncheck this check box. The selected object remains a completely independent object.

Clicking the *OK* button opens a *New Shape* window. Shapes are created in their own workspace and inserted into the model when they're needed. You can also insert a shape instance into other shape windows. You can create one or more objects in this window.

A shape window looks the same as a model window. The only noticeable difference is the name in the title bar.

Name of model
Name of this shape
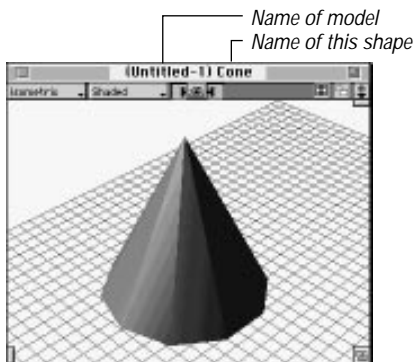
You can have more than one shape window open at a time. The number of open windows depends on the amount of memory available.

If the shape is based on a selected object, the new shape retains all of the properties of the selected object. This includes the geometry, proportions, surface maps, etc.

Any new shapes you create in the active model appear on the upper portion of the *Shapes* tab. To save new shapes so they can be used in other models, select the **SAVE…** command from the Plus menu of the Resource Palette.

Each time you insert a shape in your model, it is treated as an instance of the shape, not as a separate object.

If your shape contains more than one object, the objects are grouped together and inserted into your model as a single grouped object.

Ungrouping a shape instance at a different level will break its link to the shape, and it will be treated as a separate, regular unnamed object.

EDITING SHAPES

Click the *Edit* button to edit the shape selected on the palette. If the selected shape is not already in the model, it will automatically load first, and then its shape window opens for editing. Clicking this button opens the shape window of the selected instance. This button is accessible only when an instance of a shape is selected. If the selected object is not linked to any shape, the button is dimmed.

If you double-click on a shape instance in the modeling window, the shape window for that object opens.

If more than one shape is selected in the modeling window, the shape window for each shape is opened and can be edited. *See* **Selecting Objects** *on page 82* for information on selecting multiple objects.

Any changes that you make in the shape window are reflected in all instances of the shape. The preview on the palette also reflects any changes you made to the shape.

INSERTING SHAPES

Click the *Insert* button to insert the selected shape into the active model. The shape is loaded into the model, if necessary, and then an instance of the shape is automatically inserted into the model relative to the view set center.

You can also insert a shape with the drag-and-drop method. Select the shape from the Resource Palette, then drag-and-drop it in the modeling window. An instance is placed on the active grid at the location the mouse button is released.

SAVING SHAPES

When you create new shapes, they become part of the active model and will be saved with the model. However, unless you save the shapes to disk, they cannot be accessed for use in other models. A **SAVE** command is provided in the Plus menu for saving shapes you create so you can access them later for use in other models. *See* **Plus menu***, below.*

IMPORTING SHAPES

Click the *Import* button to import shapes into the active model. This is the same as using the **IMPORT** command in the File menu. When you import a file from another source, that file is put into a shape workspace and will appear in the upper portion of the Resource Palette, along with all of the other shapes that are loaded in your model. Only file types recognized by StudioPro will be available with this command. *See* **Import** *on page 13* for more information.

The Plus Menu

When the *Shapes* tab is active, the Plus menu provides commands for working with shapes. Use the Plus menu to save, load, and remove shapes from the active model.

NEW. This command is the same as clicking the *New* button on the left side of the palette. For information on creating a new shape, *see page 161*.

SAVE... Any new shapes you create are part of the current model and are saved with your model. If you want to have access to these shapes for use in other models, you'll need to save them with this command. When you select the **SAVE...** command, a dialog appears allowing you to specify a name and the location for the save procedure.

DELETE SELECTED. This command does not delete the shape from disk; it only removes it from the model, thus releasing the memory required to store it in your model. However, if you haven't saved it yet and it does not already exist as part of the shape library, it will be permanently lost.

DELETE UNUSED. You can delete all of the shapes that aren't being used from the model. Removing unnecessary shapes decreases the amount of memory required for the model.

If the shape has already been saved using the **SAVE...** command, this command doesn't delete the shape from your disk, just from the model itself. However, if you haven't saved the shape to disk yet, once it's deleted from your model, you won't be able to access it again.

INSERT/APPLY. Use this command to insert any loaded shape into your model. A list of all loaded shapes appears in a pop-up list when you select the command from the menu. The **INSERT/APPLY** command is available if at least one shape is loaded in the model, either created directly or loaded from a library. An instance of the shape is placed in the model relative to the view set center.

EDIT. Use this command to edit an existing shape. This command is available if at least one shape is loaded into the active model. If no shapes have been created or loaded, the command is dimmed.

A sub-menu lists the available shapes. Only those shapes currently loaded can be edited with this command.

You can also select a shape from the *Shapes* tab of the Resource Palette and click the *Edit* button. This automatically loads the shape and opens the shape window for editing.

Any changes made to the shape in the shape window are reflected in all instances of the shape.

HIDE. Use this command to hide a shape. This command is available if at least one shape has been loaded into your model. The command is dimmed if there aren't any shapes loaded.

A sub-menu displays a list of currently loaded shapes. When you choose a shape from this list, all instances of the shape are hidden throughout the entire model. Hidden shapes do not appear visible when rendered.

A check mark appears next to the name of hidden shapes in the **HIDE SHAPES** sub-menu. If you select a previously-hidden shape in the sub-menu, it un-hides the shape by toggling the show/hide status of the object.

When you hide a shape using this command, the shape is hidden in the modeling window only. Its current status in renderings is unaffected.

EFFECTS

The *FX* tab on the Resource Palette contains a variety of special effects to use in your modeling. You can create custom effects to meet your needs.

The top portion of the FX tab contains the effects that are loaded in the active model. When expanded, the palette also displays all of the effects available for use in your model. Effects can be loaded even though they aren't being used in the current model. A command is provided in the Plus menu that allows you to remove any unused effects from your model.
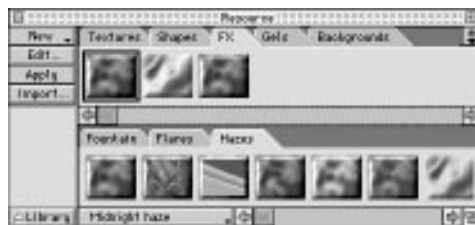
Each effect has its own dialog that allows you to customize the effect. Unless otherwise specified, the units used are those defined in the *Set Units* dialog (Edit menu).

StudioPro contains several different types of effects. You can create volumetric effects, such as *Mist* or *Fog*, that occupy the space within the objects to which they're applied; particle effects, such as *Fountain*, which are comprised of individual particles; and post-rendering effects, such as *Lens Flare* and *Aura*, that are applied after the image completes rendering.

The objects to which volumetric effects are applied do not appear in the final rendering; these objects are used merely for the purpose of defining the volume to which the effect (mist, fog, etc.) is confined. Once a volumetric effect is applied to an object, the object itself will not be visible when rendered.

NOTE *Volumetric effects, such as Fog, Mist, and Haze, must be applied to solid, one-sided objects only in order to be visible when rendered. If a volumetric effect is applied to a double-sided object, it will not be visible when rendered.*

Once a volumetric effect has been applied to the object, the object itself will not appear when rendered. Therefore, if you apply a volumetric effect to a double-sided object, neither the effect nor the object will be visible when rendered.

This allows you to place fog, for example, within a cube; but when the scene is rendered, only the fog is visible. The cube is not visible when rendered, because no textures were applied to the cube.

You can edit the placement of most effects using the **EDIT PLACEMENT** command in the Modeling menu. If the position of the effect can be changed, the effect appears in the **EDIT PLACEMENT** sub-menu.

CREATING EFFECTS

To create a new effect, hold down the *New* button. A list of available effects is displayed. When you select an effect from this list, the appropriate dialog appears.

Fog

The *Fog* volumetric effect allows you to define areas of your model that contain

fog. To be visible, fog must to applied to one-sided objects only. The fog fills the entire volume of the object, but the object itself will not be visible unless a texture has been applied. You can vary any of these settings over time.

Edit at. Select *Current Time*, *All Time*, or *Custom*. If you select *Custom*, enter the time at which you want these settings to apply for this *Fog* effect.

Name. A default name appears in this field. You can change the name as desired.

Copy from... All currently loaded *Fog* effects appear in this list. To edit an existing *Fog*, select one from the list. All settings from that *Fog* are applied to the new *Fog*. The original *Fog* is unaffected.

Color. This is the color that is transmitted through the fog. Any color other than white will obscure objects seen through the fog. When the *Link colors* box is checked, this is the color used in the *Direct* and *Bounce* fields as well.

Direct. This is the color of the light reflection from directional light sources.

Bounce. This is the color of the ambient light that bounces off, or is reflected from, the individual particles within the selected layer of fog.

Logarithmic. If *Logarithmic* is selected, a natural looking, even fog that trails off with distance is created.

Linear. When *Linear* is selected, a very simple fog that obscures evenly over distance is created.

Maximum depth. This sets the maximum depth of the fog and prevents it from completely obscuring the background.

Start depth. This is the distance at which the fog begins.

Density. This setting determines how dense the fog is, or how much the fog obscures with each unit of distance. Enter any value from 0.0 to 100.0; however, values from 1.0 to 10.0 produce the best results.

Enable shadows. When this option is enabled, shadows cast by other objects are visible within the volume.

Link colors. When this box is checked, the color specified in the *Color* field is used in the *Direct* and *Bounce* fields as well.

Preview. This area allows you to preview the *Fog* effect with its current settings. You can select the type of object used for the preview rendering from the pop-up list. Choose from a cube, sphere, or cylinder, or you can use an object that's selected in the modeling window for the preview. However, the more complex the object you use for the preview, the more time required to render the preview.

Click the camera icon to render a preview of this *Fog* effect. This allows you to see what the fog looks like with the current settings.

Haze

Use the *Haze* volumetric effect to create layers of haze that sit in valleys or layers

of smog that rest over a city. To be visible, this effect must to applied to one-sided objects only. The haze fills the entire volume of the object, but the object itself will not be visible unless a texture has also been applied to the object.

All fields, except *Name* and *Copy from...*, apply ONLY to the layer selected in the *Layer* pop-up list. The number of layers cannot vary over time, but you can change the characteristics of each layer over time.
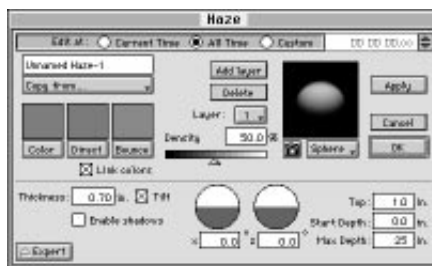
Edit at. Select *Current Time*, *All Time*, or *Custom*. If you select *Custom*, enter the time at which you want these settings to apply for this effect.

Name. A default name appears in this field. You can change the name as desired.

Copy from. All currently loaded *Haze* effects appear in this list. To edit an existing haze, select one from the list. All settings from that haze are applied to the new *Haze* texture. The original *Haze* is unaffected.

Color. This is the color that is transmitted through the selected layer of haze. Any color other than white will obscure objects seen through the haze. When the *Link colors* box is checked, this is the color used in the *Direct* and *Bounce* fields as well.

Direct. This is the color of the light reflection from directional light sources on the selected layer of haze.

Bounce. This is the color of the reflected ambient light as it bounces off the individual particles within the selected layer of haze.

Link colors. When this box is checked, the color specified in the *Color* field is used in the *Direct* and *Bounce* fields as well.

Add layer. Click this button to add an additional layer of haze.

Delete. Click this button to delete the selected layer of haze.

Layer. This setting indicates the active, or selected, layer of haze. All current settings apply to this layer only.

Density slider. Use this slider to indicate the density of the selected layer of haze.

Preview. This area displays a preview of the *Haze* effect according to the current settings. You can select the type of object used for the preview rendering from the pop-up list. Choose from a cube, sphere, or cylinder, or you can use an object that's selected in the modeling window for the preview. Remember, though, the more complex the object you use for the preview, the more time required to render the preview.

Click the camera icon to render a preview of the *Haze*. This allows you to see what the *Haze* looks like with the current settings.

Thickness. This setting represents the thickness of the selected layer of haze.

Enable shadows. When this option is enabled, shadows cast by other objects are visible within the volume.

Tilt. Checking the *Tilt* check box enables the *Tilt* controls.
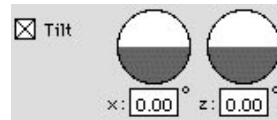
Normally, haze is oriented horizontally, but you can tilt the layers, if desired, with these controls.

Top. This setting specifies the top of this layer of haze.

Max depth. The value in this field sets the maximum depth of this layer of haze and prevents it from completely obscuring the background.

Start depth. This value in this field sets the initial depth of this layer of haze.

Mist

You can create patchy, fog-like clouds with the *Mist* effect.
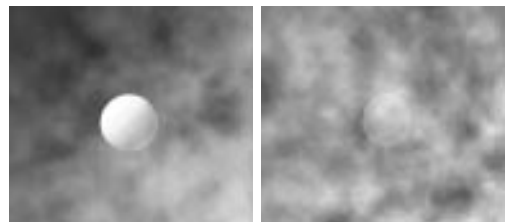
You can create numerous custom fog effects.

Mist is a volumetric effect. To be visible, it must be applied to one-sided objects only. The *Mist* fills the entire volume of the

object, but the object itself will not be visible unless a texture is also applied.

Edit at. Select *Current Time*, *All Time*, or *Custom*. If you select *Custom*, enter the time at which you want these settings to take effect.

Name. A default name appears in this field. You can change the name as desired.

Copy from... All currently loaded *Mist* effects appear in this list. To edit an existing *Mist*, select one from the list. All settings from that effect are applied to the new *Mist* texture. The original *Mist* is unaffected.

Color. This is the color that is transmitted through the mist. Any color other than white will obscure objects seen through the mist. When the *Link colors* box is checked, this is the color used in the *Direct* and *Bounce* fields as well.

Direct. This is the color of the light reflected from directional light sources.

Bounce. This is the color of the reflected ambient light as it bounces off individual particles within the mist.

Link colors. When this box is checked, the color specified in the *Color* field is used in the *Direct* and *Bounce* fields as well.

Detail. This setting controls the amount of detail in the *Mist*. Enter a value from 0 to 100. A value of 100 produces a very smooth mist; a value close to zero produces a lot of detail, or variation, in the mist.

Minimum Density. This setting defines the level of the least opaque areas of the mist. Enter a value from 0.0 to 100.

Maximum Density. This setting defines the level of the most opaque areas of the mist. Enter a value from 0.0 to 100.

Preview. You can select the type of object used for the preview rendering from the pop-up list. Choose from a cube, sphere, or cylinder, or you can use an object that's selected in the modeling window for the preview. Remember, though, the more complex the object you use for the preview, the more time required to render the preview.

Click the camera icon to render a preview of the *Mist*. This allows you to see what the *Mist* looks like with the current settings.

Seed. Enter any value in this field to ensure that this mist will look different from all other *Mist* effects, even when all of the other settings are the same.

Scale. This setting determines the size of the largest patches of mist.

Evolve. When a check appears in this box, the mist will grow and change over time;

otherwise, the mist effect is similar to the appearance of the inside of an ice cube.

Speed. This setting determines the speed at which the mist evolves over time.

Minimum depth. This sets the minimum depth of the mist.

Maximum depth. This sets the maximum depth of the mist and prevents it from completely obscuring the background.

Apply in Object Space. The object is filled with mist, and when the object moves, the mist moves with it, as you would expect.

Apply in World Space. When this button is selected, it's as though mist exists every-where in space, but it is only visible within the boundaries of the object to which it's applied.

Enable shadows. When this option is enabled, shadows cast by other objects are visible within the volume.

Fountain

The *Fountain* effect emits particles, such as water droplets, which fall to the ground and die.
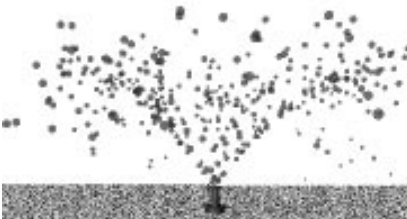
You can create custom *Fountain* effects which, by their nature, change over time.

Once you've created a *Fountain*, apply it to an object. Initially, the *Fountain* effect begins at the origin point of the object to which it's applied, but you can reposition the starting point of the *Fountain* effect with the **EDIT PLACEMENT** command in the Modeling menu. In the example above, the starting point of the effect was moved to the top of the object, causing the fountain effect to begin at this point.
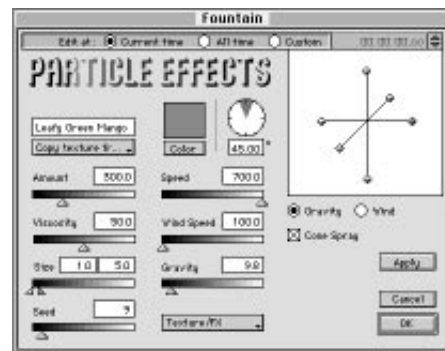
Edit at. Select *Current Time*, *All Time*, or *Custom*. If you select *Custom*, enter the time at which you want these settings to take effect for this *Fountain*.

Name. A default name appears in this field. You can change the name as desired.

Copy from. All currently loaded *Fountains* appear in this list. If you want to edit an existing fountain, select one from the list. All settings from the original effect are applied to the new effect, and the original remains unchanged.

Color. Click the *Color* button to display the Color Picker dialog. Select a color for the water droplets.

Angle of Spray. Use this control to specify the width, in degrees, of the spray coming from the fountain. Acceptable range: 1° to 360°.

Amount. Enter a value or use the slider to define the amount of water being emitted from the fountain. The value entered represents the number of particles per second being emitted. You can enter any number in this field, but values from 50.0 to 1000.0 give the best results. The default value for this field is 500.0.

Viscosity. The setting in this field determines the thickness of the atmosphere through which the particles move. This field works in conjunction with *Wind Speed*. For example, if the viscosity of the atmosphere is very low, wind blowing on the particles will have little effect. The slider represents values from 0.0 to 100. The viscosity of water is 100, but you may want to simulate thicker substances, such as mud or lava. Therefore, you can enter a higher value in the numeric input field.

Seed. Enter any value in this field. This setting ensures that the *Fountain* will look unique, even when all of the other settings are the same.

Size. Enter a minimum droplet size and a maximum droplet size, or use the slider controls to define the minimum/maximum sizes. Any value can be entered, but values from 0.1 to 10.0 provide the most realistic appearance. The default settings are 1.0 (minimum) and 5.0 (maximum).

Speed. This field determines the velocity at which the particles are emitted from the fountain. Any value (in units per second) is acceptable, but values from 1.0 to 1000.0 provide the best results. The default setting is 500.0.

Wind Speed. This field determines the speed at which the wind blows in units/sec. You can enter any value in this field, but values from 1.0 to 1000.0 provide the best results. The default setting is 300.0.

Gravity. Enter a value in this field, or use the slider, to define the strength of gravity (in units/sec/sec). Earth's gravitational pull is 9.8 meters/sec/sec.

Textures/FX. You can apply a texture or effect to a fountain. All available textures and effects appear in the *Textures/FX* pop-up list. Those effects or textures that are currently applied appear with a check beside the name. A fountain can have multiple textures or effects; however, use caution when applying multiple effects as they may require a substantial amount of memory. To remove an effect or texture, select it again from the pop-up menu; the check is removed indicating it is no longer applied to the fountain.

Cone Spray. If this box is checked, the particles spray out of the fountain only around the perimeter of the cone. If unchecked, particles spray from the center randomly in all directions within the cone.

Gravity radio button. Select the *Gravity* button to interactively define the direction gravity pulls the particles.
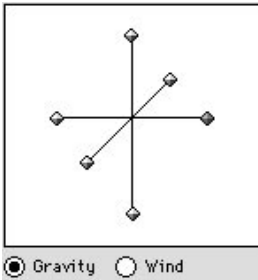
Grab any handle and drag to position it where desired. The red handle indicates the direction the particles are pulled by gravity.

Wind radio button. Select the *Wind* button to interactively define the direction the wind blows the particles.
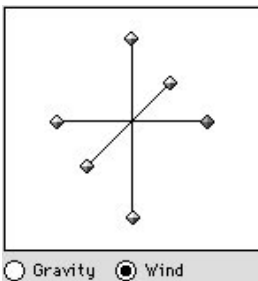
Grab any handle and drag to position it where desired. The red handle indicates the direction the wind is blowing.

Lens Flare

Lens Flare is caused when a camera lens is pointed toward a bright light source. You can apply a *Lens Flare* effect to any object or light source in the model. This is a post-rendering effect.
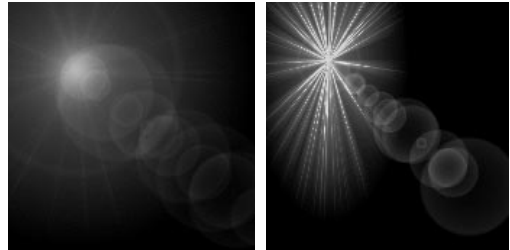
You can create a wide range of different Lens Flare effects by varying the values in the Lens Flare dialog.

The position of the origin point of the object to which the *Lens Flare* effect is applied determines the exact location where the effect begins. However, you can use the **EDIT PLACEMENT** command in the Modeling menu to change the position of the starting point.

Edit at. Select *Current Time*, *All Time*, or *Custom*. If you select *Custom*, enter the

time at which you want these settings to apply for this *Lens Flare* effect.

Name. A default name appears in this field. You can change the name as desired.

Copy from... All currently loaded *Lens Flares* appear in this list. If you want to edit an existing effect, select one from the list. All settings from that effect are applied to the new *Lens Flare* effect. The original *Lens Flare* is unaffected.

Preview. This preview allows you to see what the *Lens Flare* looks like with the current settings.

Intensity. This setting determines the intensity of the *Lens Flare* effect. Enter a value from 0 to 100 percent.

A *Lens Flare* effect consists of two separate components: *Flash* and *Glare*. The center section of the *Lens Flare* dialog contains settings that pertain to the *Flash*.

Flash is the bright area directly over the light source. It simulates lens astigmatism. The following fields pertain specifically to *Flash*:

- **Flash color**. Select a color to tint the flash.

- **Saturation**. This setting controls how white-hot the center becomes. Enter a value from 0.0 to 100 percent.

- **Size**. This field determines how large the flash is (in degrees of viewing angle). Enter a value from 0 to 100 percent. It is possible to completely white-out the entire picture.

- **Chaos**. This field controls how disorderly the rays appear around the light.

The lower the setting, the more even the distribution of rays.

- **Rays**. This field determines the number of rays or spokes of light that radiate from the light. Enter any number in this field.

- **Glow**. This setting controls the amount of soft illumination that occurs around the flash. Enter a value from 0 to 100 percent.

- **Seed**. Enter any value in this field. This setting ensures that the *Lens Flare* will look unique, even when all of the other settings are the same.

- **Rotate**. Specify the total number of degrees to rotate the *Lens Flare* effect.

- **Enable Flash**. This check box turns the *Flash* on or off.

- **Plasma**. This check box turns *Plasma* on or off. Plasma makes the flash appear more harsh by adjusting the profile to look less like an optical effect.

- **Blend mode**. When this box is checked, the color of the flash and the color of the object are averaged together. When this box is unchecked, the flash and object colors are added together, often resulting in overexposure.

The lower section of the dialog contains settings for the *Glare* component of the *Lens Flare* effect.

Glare is the rings, halos, rainbows, or disks of light which may be offset from the light source. These effects simulate reflections and refractions within the lens.

- **Glare Color**. The color specified here determines the tint given to the glare elements. However, if the value in the *Glare - Chaos* setting is high, the variation of colors increases.

- **Saturation**. This field controls to what extent the halos appear white hot.

- **Size**. This field determines the maximum size of the disks of light. Glow elements will range from very small up to the size specified in this field.

- **Chaos**. This setting controls how much disorder occurs with the placement, color, and size of the glare elements. Enter a value from 0 to 100 percent.

- **Detail**. This setting determines the total number of *Glare* elements in the Lens Flare.

- **Opacity**. This field determines the highest opacity level of any of the glare elements. In reality, this tends to be less than about 30 percent, but this amount may be increased substantially to create some interesting special effects. Acceptable values range from 0 to 100 percent.

- **Seed**. A value in this field ensures the uniqueness of the *Glare* elements, even when all of the other settings are the same.

- **Spread**. This value represents the percentage of the maximum possible spread allowed, as determined by the position of the object to which the lens flare effect is applied, relative to the camera's position.

- **Enable Glare**. This check box turns *Glare* on or off.

Aura

Aura is the haze of light that appears around an object. You can create a variety of interesting effects with this feature by varying the values in the *Aura* dialog.
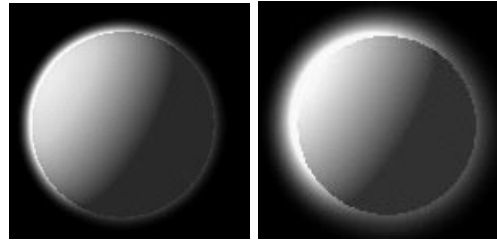
Aura is a post-rendering effect, and is added to the image when it finishes rendering.

Edit at. Select *Current Time*, *All Time*, or *Custom*. If you select *Custom*, enter the time at which you want these settings to take effect.

Name. A default name appears in this field. You can change the name as desired.

Copy from... All currently loaded *Aura* effects appear in this list. If you want to edit an existing effect, select one from the list. All settings from that effect are applied to the new *Aura* effect. The original *Aura* is unaffected.

Outer. When this button is selected, the *Aura* effect begins just beyond the edge of the object.

Inner. When this option is selected, the *Aura* effect overlaps the boundaries between the object and the background.

Both. When this option is selected, the *Aura* effect will appear over the entire surface of the object, as well as extending beyond the edges.

Blend mode. When this box is checked, the color of the aura and color of the object are averaged together. When this box is unchecked, the colors of the aura and the object are added together, often resulting in overexposure.

Color. Click this button to display the Color Picker dialog. Select a color for the *Aura* effect.

New Color. When this box is unchecked, the color of the *Aura* effect is the same color as the object to which it's applied.

Because this is a post-rendering effect, the exact color present in the rendered image is used. Therefore, on areas that are not well-illuminated, the *Aura* effect may appear darker than on well-lit areas.

If you select a new color (by checking this check box), the exact color you select is used evenly around the entire object, regardless of lighting intensity at any particular point on the object.

Intensity. This is the opacity of the aura immediately surrounding the object. Enter a value from 0 to 100 percent.

Size. This is the distance the glow extends from the object. Size is entered as a percentage of the diameter of the object.

Preview. This area displays a preview of the *Aura* effect according to the current settings. You can select the type of object used for the preview rendering from the pop-up list. Choose from a cube, sphere, or cylinder, or you can use an object that's selected in the modeling window for the preview. However, the more complex the object you use for the preview, the more time required to render the preview.

Click the camera icon to render a preview of the effect. This allows you to see what the *Aura* looks like with the current settings.

EDITING EFFECTS

You can edit any of the effects on the Resource Palette. Click the *Edit* button to edit the selected effect. If the effect is not already loaded in the active model, it will load, and the appropriate dialog appears.

Whenever you edit an effect, it's a good idea to change the name of the effect. Then you can use both the original and the edited versions of the effect in your model.

The edited effect becomes part of the current model. If you want to access this effect for use in other models, select the **SAVE...** command from the Plus menu.

You can edit an effect so it appears to change over time. When you edit any of the special effects, you can specify the time at which the changes occur. Remember, however, changes to any effect occur on ALL of the objects to which that particular effect is applied.

APPLYING EFFECTS

Select an effect on the Resource Palette and click the *Apply* button. The effect is

applied to the selected object. If no object is selected, the button is dimmed.

You can also apply an effect with the drag-and-drop method. Select the effect on the Resource Palette, then drag it to the desired object. When the object highlights, release the mouse button.

Effects are applied to the origin point of the selected object. For example, if a fountain is applied to an object, the fountain effect's starting position (the point at which the water droplets are emitted) is set at the position of the object's origin point. If you change the location of the origin point, the starting position of the effect will also change.

SAVING EFFECTS

When you create a new effect, it becomes part of, and is saved with, the model. However, if you want to be able to access the effect for use in another model, you must save the effect to disk. A **SAVE** command is provided in the Plus menu. *See* **Plus menu**, *below.*

IMPORTING EFFECTS

Click the *Import...* button to load effects into the model from other locations. Only effects with file types recognized by StudioPro can be imported.

Plus Menu

When the *FX* tab is active, the commands contained in the Plus menu apply to effects.

NEW. This command is the same as clicking the *New* button on the left side of the

Resource Palette. For information on creating new effects, *see* **Creating Effects** *on page 165.*

SAVE... This command allows you to save any effects you create so you can access them for use in other models later.

When you select the **SAVE...** command, a dialog appears allowing you to specify a name and the location for the save function. If you want the effects to appear in the Library portion of the Resource Palette, you can save them to the *Libraries* folder inside the *Strata StudioPro* folder. *See* **Handling Resources** *on page 138.*

DELETE SELECTED. Select this command to delete the selected effect from your model. This command does not delete the effect from disk. However, if you haven't saved the effect yet and it doesn't exist as part of the effects library, it will be permanently lost.

DELETE UNUSED. Select this command to delete all of the unused effects from the active model, thus decreasing the amount of memory required for the model.

If the unused effects haven't been saved yet and are not part of the effects library, you will not be able to access them again.

INSERT/APPLY. Select an effect from the command's pop-up list to apply to the selected object in your model. All loaded effects appear in this list.

EDIT. This command is available when at least one effect is loaded into the model. All effects that are currently loaded in the active model appear in a sub-menu. Select the effect that you want to edit. Editing the effect will change all instances of the

effect. If you want to retain the current settings for some of the objects in your model, you may want to create a new effect, copied from an existing one. This will allow you to have access to both versions of the effect.

GELS

Gels are special textures which are applied to light sources. When gels are applied, the light source projects the pattern or images present in the gel onto the objects the light source is illuminating.

Click on the *Gels* tab to make it the active tab. When this tab is active, you can make new gels or edit existing ones.
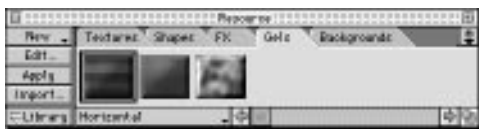
All of the currently loaded gels appear in the upper portion on the *Gels* tab. To expand the palette so all of the gels contained in the *Gels* library are also displayed, click the *Library* button.

Several built-in gels are included with StudioPro. They are stored in the *Gels* folder within the StudioPro application folder. All gels contained in this folder at the time the application is launched are available for use in your model.

CREATING GELS

To create a new gel, click the *New* button. The *Image Gel* dialog is displayed.

Edit at. This field lets you specify the time at which you want the settings to take effect for this gel. By changing the time (with the *Custom* option) you can create a gel that changes over time.

Name. This field contains the name of the gel. It is helpful if you use a descriptive name that indicates the appearance of the gel. You can change the name of the gel at any time.

Copy from... This field lets you copy the settings from gels that are currently contained in the active model. All currently loaded gels appear in the pop-up list.

Color. This button opens the *Color Picker* dialog, allowing you to select a color for the gel.
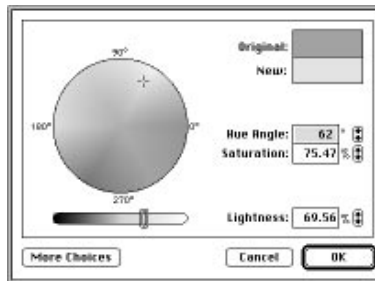
Map. When you click this button, the *Image Map* dialog appears.

- **Load**. This button allows you to load an image or animation that will be projected onto objects illuminated by the light source. You can load any format supported by StudioPro. This includes PICT, TIFF, Targa, and JPEG formats for single frames. Acceptable animation formats include QuickTime movie, or sequentially numbered PICT, TIFF, Targa, or JPEG images. If you load an animation, the light source acts similar to a movie projector and the moving image appears on objects struck by the light.

- **Color depth**. This field allows you to select a color-depth for the image or animation from the pop-up list. Reducing the color depth can save memory.

- **Frame rate**. This field allows you to select a frame rate for a movie. This field is not available if no movie is present.

- **Track**. This field lists all tracks in the current movie. If no movie is present, this field is not available.

- **View size, Orientation**. You can set the view size and the orientation of the map in these fields.

- **Color/Grayscale**. You can convert the map to grayscale in this dialog.

- **Play Movie**. This button displays the animation playback window and plays the QuickTime movie specified in the *Map* field. This button is available only for QuickTime movies; the animation playback window does not support sequentially numbered images. However, sequentially numbered PICT, TIFF, Targa, and JPEG images are acceptable formats for use as texture maps.

- **Invert**. The *Invert* check box is used to invert the map.

Tiling. If the gel contains an image or animation, this pop-up list lets you choose a tiling method. A map present in the gel definition can be repeated in different patterns:

 Normal. The map repeats in a straight manner, beginning over each time the previous pattern ends.

 Mirrored. The image alternates end-for-end each time it repeats.

 None (No tiling). The image appears once at the scale or coverage specified.

Scale. These fields let you adjust the scale of the map.

 When the Lock is in its closed (locked) position, the dimensions of the map remain proportional.

 Changing the value in one field causes StudioPro to update the value in the other field so the proportions of the map are maintained.

To ensure the map used in the gel remains proportional, the *Lock* icon needs to be in its "locked" position. To remove this constraint, click on the *Lock* icon to change it to its "unlocked" position. When in this position, the value entered in one field does not affect the value in the other field.

When the Lock is in its open (unlocked) position, you can change the value in one field without affecting the value in the other field.
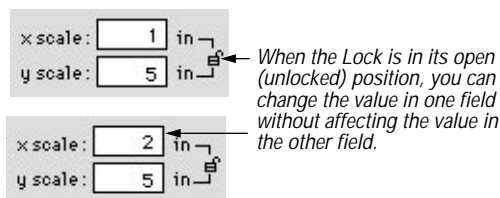
Preview. This area displays a preview of the gel with its current settings. You can select the type of object used for the preview rendering from the pop-up list. Choose from a cube, sphere, or cylinder, or you can use an object that's selected in the modeling window for the preview. However, the more complex the object you use for the preview, the more time required to render the preview.

 Click the camera icon to render a preview of the gel.

Once you've created the gel, it appears on the upper portion of the *Gels* tab on the Resource Palette and becomes part of the active model.

EDITING GELS

You can edit any of the gels on the Resource Palette. With the *Gels* tab active, click the *Edit* button to edit the selected gel. If the gel is not already loaded in the active model, it will load, and the appropriate *Gel* dialog appears.

It's a good idea to change the name of any gel that you edit. Then you can use both the original and the edited versions of the gel in your model.

Once you edit the gel, it becomes part of the current model. If you want to have access to this gel for use in other models, select the **SAVE...** command from the Plus menu.

You can edit any gel so it appears to change over time. Specify the time at which the changes occur by entering a time in the *Edit At* field. Remember, however, that changes you make to any gel occur on ALL of the lights to which that particular gel is applied.

APPLYING GELS

Gels can be applied to light sources in several different ways:

• Select a gel on the Resource Palette and click the *Apply* button. The gel is applied to the selected light source. If no object is selected, the button is dimmed.

• Gels can also be applied from the Object Properties Palette of the selected spotlight or point light.

• You can drag-and-drop a gel from the Resource Palette to any spotlight or point light in the model.

• Gels can be applied to global lights from the *Lights* tab of the Environments Palette.

SAVING GELS

When you create a new gel, it becomes part of, and is saved with, the model. However, if you want to be able to access the gel to use in other models, you must save it to disk. A **SAVE** command is provided in the Plus menu. *See* **Plus menu**, *below*.

IMPORTING GELS

Click the *Import...* button to load gels from other locations into the active model. Only gels with file types recognized by Studio-Pro can be imported.

Plus Menu

When the *Gels* tab is active, the commands contained in the Plus menu apply specifically to gels.

NEW. This command is the same as clicking the *New* button on the left side of the Resource Palette. For information on creating new gels, *see* **Creating Gels** *on page 176.*

SAVE... This command allows you to save any new gels you create so you can access them later for use in other models.

When you select the **SAVE...** command, a dialog appears allowing you to specify a name and the location for the save function. If you want the gel to appear in the Library portion of the Resource Palette, you can save them to the *Libraries* folder inside the *Strata StudioPro* folder. *See* **Handling Resources** *on page 138.*

DELETE SELECTED. Select this command to delete the selected gel from your model. This command does not delete the gel from disk. However, if you haven't saved the gel yet and it doesn't exist as part of the *Gels* library, it will be permanently lost.

DELETE UNUSED. Select this command to delete all of the unused gels from the active model, thus decreasing the amount of memory required for the model.

If the unused gels haven't been saved yet and are not part of the *Gels* library, you will not be able to access them again.

INSERT/APPLY. Select a gel from the command's pop-up list to apply to the selected light source in your model. All loaded gels appear in this list.

EDIT. This command is available when at least one gel is loaded into the model. All gels that are currently loaded in the active model appear in a sub-menu. Select the gel that you want to edit. If you want to retain the current settings for some of the gels applied to light sources in your model, you may want to create a new gel, copied from an existing one. This will allow you to have access to both versions of the gel.

BACKGROUNDS

StudioPro allows you to add backgrounds to your models without the need to create any unnecessary geometry. Several different types of backgrounds are provided. In addition to the backgrounds that are included, you can create your own custom backgrounds which can be used as either

visible backgrounds, or as reflected backgrounds that appear as reflections in the objects in your model.

Click on the *Backgrounds* tab to bring it to the front of the Resource Palette, making it the active tab.
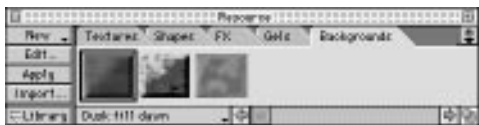
The upper portion of the palette contains any backgrounds that are currently loaded in the active model.

To display the backgrounds contained in the library, click the *Library* button.
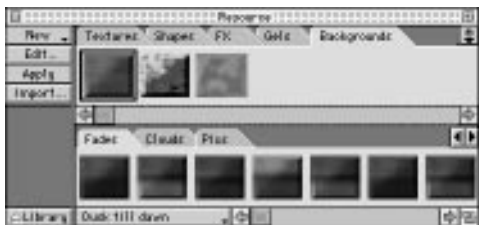
CREATING BACKGROUNDS

To create a new background, hold down the *New* button on the left side of the Resource Palette. A list of available background types appear in the pop-up list.
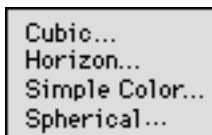
You can choose to create a new *Cubic*, *Horizon*, *Simple Color*, or *Spherical* background.

Cubic vs. Spherical

A spherical background consists of a single plane, wrapped around the model on an imaginary sphere, and bunched up at the top and the bottom to fit on that sphere.

A cubic environment consists of six different planes: top, bottom, front, back, left, and right. You can use up to six maps, with a different one on each face of the cube.

An important difference between spherical and cubic backgrounds is the way light reflects from them. Light does not reflect from a spherical background onto a flat surface as well as it does from a cubic background. For example, if your model consists of extruded text with a shiny surface applied, you might want to use a cubic background to take advantage of the increased reflectivity it allows. The end result of your rendering may appear quite different, depending on which type of background you choose.

Select **Spherical** to load a single image or animation to use as a background. The *Spherical* dialog appears.

To create a cubic environment instead, select *Cubic* from the pop-up list.

Both dialogs contain the same fields. The only difference between the two dialogs is that you can load up to six images or animations to use in a cubic background, while a spherical background may contain only one.

Name. A default name is provided which can be changed. This is the name that appears on the *Background* tab on the Resource Palette.

Copy from. This field allows you to copy the settings from an existing background to create a variation for the new background. The original background is unaffected. All currently loaded spherical backgrounds appear in the *Copy from* field on the *Spherical* dialog, and currently loaded cubic backgrounds appear in the *Copy from* field on the *Cubic* dialog.

Map. Click the *Map* button to display the *Image Map* dialog.

• **Load**. This button allows you to load an image or animation to use as a map for the background. You can load any format supported by StudioPro. This includes PICT, TIFF, Targa, and JPEG formats for single frames. You can create a background that changes over time by loading an animation file instead of a single image file. Quick-Time movies or sequentially numbered images in any of the formats supported by StudioPro can be used for backgrounds.

Cubic backgrounds allow you to load up to six different images or animations. If you want to use the same map on each plane of the background, load the map into the *Front* field and check the *Use Front image for all sides* check box. A default black background will be used for any face that does not contain a map.

• **Color depth**. This field allows you to change the color-depth of the image or animation. Reducing the color depth

can save memory. A color map stored as a 32-bit image requires four times more memory than an eight-bit color map. However, once you change the color depth, you'll need to re-load the map to revert to its original color depth.

- **Frame rate**. This field allows you to select a frame rate for a movie. This field is available only when a movie is present.

- **Track**. This field lists all tracks in the current movie. If no movie is present, this field is not available.

- **View size, Orientation**. You can set the view size and the orientation of the map in these fields.

- **Color/Grayscale**. You can convert the map to grayscale in this dialog.

- **Play Movie**. This button displays the animation playback window and plays the QuickTime movie specified in the *Map* field. This button is available only for QuickTime movies; the animation playback window does not support sequentially numbered images. However, sequentially numbered images in any of the formats supported by StudioPro are acceptable formats for use as background maps.

- **Invert**. The *Invert* check box is used to invert the map.

You can change the scale or mapping parameters for the individual background maps. Backgrounds using maps are usually scaled smaller.

Cubic backgrounds allow you to adjust the scale and mapping parameters for

each individual map. Select a map from the pop-up list, or select *All Faces* if all of the maps are to be scaled and tiled the same.

Horizontal/Vertical Repetitions. You can specify how many times to repeat the image.

Tile. Select a tiling style from the *Tile* pop-up list:

 Normal. The map repeats in a straight manner, beginning over each time the previous pattern ends.

 Mirrored. The image alternates end-for-end each time it repeats across the surface.

 None (No tiling). The image appears once at the scale or coverage specified.

Vertical/Horizontal Coverage. The values in the horizontal and vertical coverage fields are entered as percentages; 100% scales the map to cover the entire environment sphere once, a setting of 33% scales the map to tile three times. To return to the *Get Image* dialog, click the *Background Image* button.

Simple Color

Select **Simple Color** to define a single color to use as a background. The *Simple Color* dialog appears.
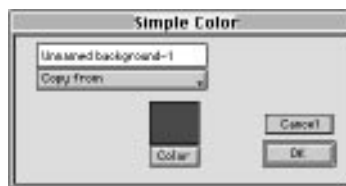
Name. A default name is provided which can be changed. This is the name that appears in the Resource Palette.

Copy from. This field allows you to copy the settings from an existing simple color background to create a variation for the new background. (Perhaps you want to use a slightly less intense variation of the same color.) The original background is unaffected.

Color. Click this button to display the *Color Picker* dialog.
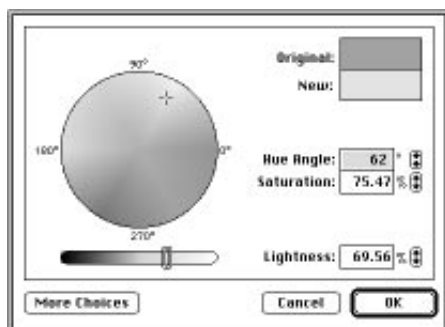
Select a color to use as the background for your model.

Horizon

Select *Horizon* to create a new sky background.

This dialog allows you to specify colors for the upper and lower areas of the background, as well as colors that appear just above and just below the horizon. An adjustable blend rate allows you to blend the colors with the proper gradation to match the lens angle of the view.

Slow blending uses a linear gradation from the horizon color to the overhead and underfoot colors. The transition from horizon color to sky color is complete within 45° of the horizon line. This is useful for wide angle lens settings.

Medium uses an accelerated linear gradation to complete the horizon color's transition by 33° above or below the horizon line. This is useful for normal lens settings.

Fast uses a logarithmic gradation to complete the color transition by 20° above or below the horizon line. This is useful for semi-telephoto lens settings.

EDITING BACKGROUNDS

Click the *Edit* button to edit the selected background. If the background is not already loaded in the active model, it will load, and the appropriate *Background* dialog appears.

It's always a good idea to change the name of any backgrounds that you edit. Then you can use both the original and the edited versions in your model.

Once you edit a background, it becomes part of the current model. If you want to be able to use this background in other models, select the **SAVE...** command from the Plus menu.

APPLYING BACKGROUNDS

Backgrounds can be applied to your model in different ways:

*   With NO objects selected in the modeling window, select a background on the Resource Palette and click the *Apply* button. The background is not visible in the modeling window, but will be present when rendered.

    If an object IS selected, that background will be used as a reflected background on the selected object(s). StudioPro accomplishes this by creating a new surface texture with all fields turned off except the *Environment* field, and this texture is applied to the selected object. The effect mixing rule is *Replace*, but because only the *Environment* field is turned *On*, all other fields from the texture below show through and are unaffected. *See* Mix *on page 202* for more information on how StudioPro mixes multiple textures. However, StudioPro will present a dialog to verify that this is what you intended to do.

    > This action will create
    > a new surface texture
    > for this object. Continue?
    >
    > Cancel   OK
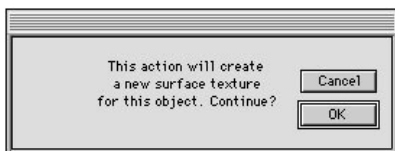
*   You can drag-and-drop a background from the Resource Palette directly into the modeling window. To apply a visible background to your model, drag-and-drop the background anywhere in the modeling window EXCEPT on an object. If you drop the background onto an object, StudioPro assumes you want that background to be used as a reflected background for the selected

object. (*See above.*) A dialog is presented to verify that this is the intended action.

*   Backgrounds can also be applied from the *Background* tab of the Environment Palette.

SAVING BACKGROUNDS

When you create a new background, it becomes part of, and is saved with, the model. However, if you want to be able to access this background later to use in other models, you must save it to disk. A **SAVE** command is provided in the Plus menu. *See* **Plus menu**, *below.*

IMPORTING BACKGROUNDS

Click the *Import...* button to load backgrounds from other locations into the active model. Only backgrounds with file types recognized by StudioPro can be imported.

Plus Menu

When the *Backgrounds* tab is active, the commands contained in the Plus menu apply specifically to backgrounds.

NEW. This command is the same as clicking the *New* button on the left side of the Resource Palette. For information on creating new backgrounds, *see* **Creating Backgrounds** *on page 180.*

SAVE... This command allows you to save any new backgrounds you create in this model so you can access them later for use in other models.

When you select the **SAVE...** command, a dialog appears allowing you to specify a name and location for the save function.

If you want any new backgrounds that you create to appear in the Library portion of the Resource Palette, you can save them to the *Libraries* folder inside the *Strata StudioPro* folder. *See* **Handling Resources** *on page 138.*

DELETE SELECTED. Select this command to delete the selected background from your model. This command does not delete the background from disk. However, if you haven't saved the background yet and it doesn't exist as part of the *Backgrounds* library, it will be permanently lost.

DELETE UNUSED. Select this command to delete all of the unused backgrounds from the active model, thus decreasing the amount of memory required for the model.

If the unused backgrounds haven't been saved yet and are not part of the *Backgrounds* library, you will not be able to access them again.

INSERT/APPLY. Select a background from the command's pop-up list to apply to the active model. All loaded backgrounds appear in this list.

EDIT. This command is available when at least one background is loaded into the model. All backgrounds that are currently loaded in the active model appear in a sub-menu. Select the background that you want to edit.

The Environment Palette contains the controls that are global to the entire model. This palette includes tabs for *Lights*, *Background*, *Air*, and *Ground*.

The Environment Palette is a floating palette. It floats above the model windows and is always available. You can move the palette around the screen and position it wherever you want. To move it, just drag it by its title bar.

You can display the Environment Palette on your desktop in one of three ways: expanded to display the entire contents of the folder, collapsed to minimum control size, or fully collapsed to display the folder tabs only.

To expand the Environment Palette to its maximum size, click the zoom box in the upper right corner of the palette.

Close box   *Title bar*   *Zoom box*
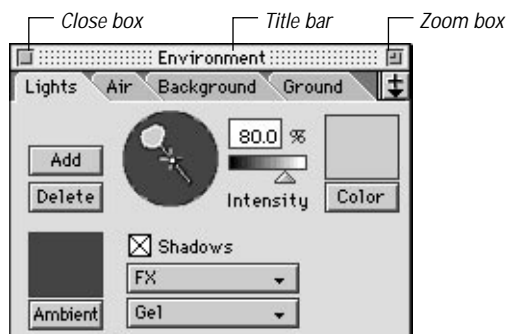
To collapse the Environment Palette to its minimum size, click the zoom box again.

You still have access to the most frequently used controls in this mode.
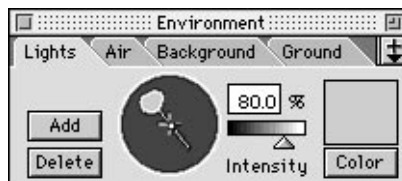
To reduce the Environment Palette even further to display only the folder tabs, select the **COLLAPSE PALETTE** command from the Plus menu.
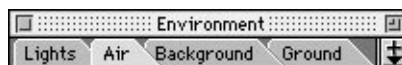
This command allows you to free up valuable screen space, but still have easy access to the Environment Palette.

To close the Environment Palette, select **HIDE ENVIRONMENT PALETTE** from the Windows menu, or click the close box in the upper left corner of the palette. You can also close the palette by clicking the Environment's Hide/Show button on the Button Bar.

Environment Palette ⎯⎯⎯

To open the Environment Palette, select **SHOW ENVIRONMENT PALETTE** from the Windows menu, or click the Environment Palette's button in the Button Bar.

If the Environment Palette is open when you quit StudioPro, it will be open the next time you launch the application.

When you enter text or numeric data from the keyboard, changes take effect when you press the *Enter*, *Return*, or *Tab* keys or when you click out of the field. Other changes to the contents of the palette (check boxes, radio buttons, etc.) occur immediately.

LIGHTS

The *Lights* tab contains controls for handling directional light sources, as well as ambient lighting. You can add, adjust, or delete directional lights from the *Lights* tab on the Environment Palette.

Directional lights are considered global in nature. They are an infinite distance away; therefore, they illuminate a model with parallel rays of light, similar to the way sunlight strikes the earth.

Directional lights are considered the primary light source for a model. In contrast, ambient light is a non-directional general illumination that fills shaded or shadow areas of a model so that details not directly illuminated by light sources are still visible.

The following fields appear on the *Lights* tab when the Environments Palettes is displayed in its standard display form:

Lighting Sphere. You can adjust the position of the light by grabbing it and rotating it to the desired position. The modeling window updates to reflect the new position of the light.

You can control the lighting in your model by repositioning, adding, or deleting light sources. The sphere around the light source(s) on the palette represents the space around your model.

Selected light source
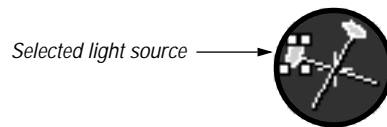
You can add or delete light sources as needed. You can select and move each light anywhere on the sphere to illuminate the model from that direction.
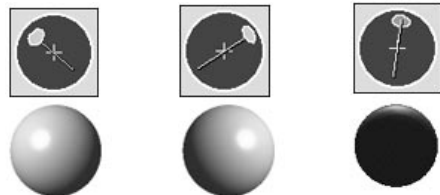
You can move the sphere to change the direction of illumination.

Use the Command key to switch between front and back hemispheres.

The lighting sphere displays the position of directional light sources relative to the currently active view. If you change the active view, the position of the light(s) shifts on the palette to correspond with the new view.

Add. Click the *Add* button to add an additional light to the lighting sphere.

Inserting multiple light sources has the same effect as increasing the intensity of a

single light to more than 100 percent. This is not recommended under normal circumstances because of the possibility of over-exposure. If you want an object to appear extra bright, you might want to consider using a glow factor in the texture that you apply to the object.

Delete. Click the *Delete* button to delete the selected light.

Intensity. You can adjust the intensity of the selected light by using the slider control or by entering a value directly. If you move the slider control, the corresponding numeric value appears in the box above the slider. If you enter a value directly in the box, the slider updates to reflect the new value. This field accepts values that range from zero to 100 percent.

Color. You can apply a color filter to a directional light. Click the *Color* button to display the *Color Picker* dialog.

When the *Lights* tab is expanded by clicking the zoom box, additional fields are displayed to allow you to further edit the selected light source.

Ambient. This field displays the current color of ambient light in the scene. Ambient light has no source; it's just present in the model.

The level of ambient light is controlled through the *Color Picker* – the brighter the color, the brighter the ambient lighting.

To change the ambient color, click the *Ambient* button. The *Color Picker* appears, allowing you to select a color to use in this field.

Shadows check box. If you want your light source to cast shadows, be sure this box is checked.

Effects and Gels. You can attach effects or gels to the selected light source. Effects include lens flares and volumetric effects, such as fog or mist. When you apply a gel to a light source, the pattern or image of the gel is projected onto the objects illuminated by the global light source.

If you hold down the *FX* or *Gel* button, a sub-menu is displayed that allows you to apply, remove, create, or edit effects or gels.
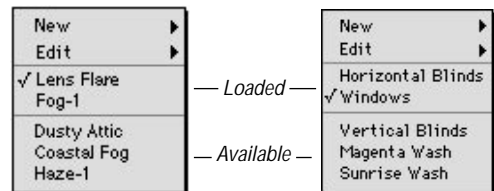
The top section of the menu contains commands for creating new effects or gels, or editing effects or gels that are already loaded in the active model.

The center section of the menu contains effects or gels that are currently loaded in the active model. Any effect or gel applied to the selected light source appears with a check beside its name.

To create a new effect or gel, select the type of effect you want to create from the *New* sub-menu from the *FX* pop-up menu, or select **NEW...** from the *Gel* pop-up menu.

FX pop-up menu

Gels pop-up menu
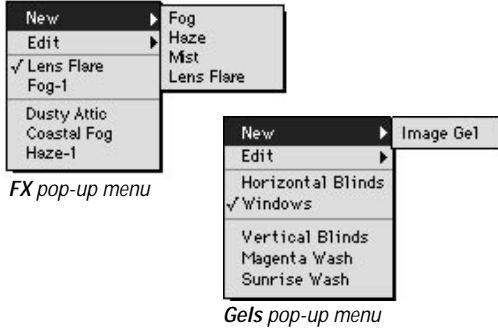
Depending on what you select, the appropriate dialog is displayed.

For complete details on creating *Fog*, *Haze*, or *Mist* effects, *see page 165*.

See page 171 for information on creating a new *Lens Flare* effect.

To create a new gel to use on the selected global light, *see page 176*.

Once you've created an effect, it appears in the center of the pop-up menu with a check beside its name.

To edit an effect or gel, select one from the *Edit* sub-menu. All effects and gels currently loaded in the active model appear in the *Edit* sub-menu.
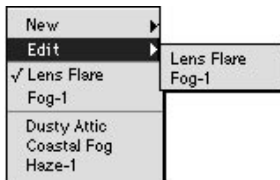
The appropriate dialog appears, allowing you to modify the current settings.

To apply an effect or gel to your model, select one from the *FX* or *Gel* menu.

Selecting an effect from the lower section...   *...moves it to the center with other loaded effects.*
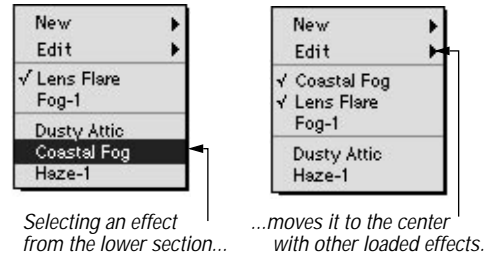
When you select any item from either the center section (loaded) or the lower section (all available in the library), a check is placed beside the name of the item, indicating that it is applied to the selected light source.

To remove an effect or gel from a light, select it again; the check mark is removed from beside its name, indicating that it is no longer applied. The effect or gel still remains loaded in the model, however. To remove an effect or gel from the memory, a **DELETE UNUSED** command is provided in the Plus menu on the Resource Palette.

Modifier keys that apply to directional light sources:

- **Shift key** allows you to select multiple light source icons.

- **Command key** allows you to toggle between the front and back hemispheres.

- **Option key** leaves a copy of the light source in the original position as the original is dragged to a new location. This is an alternative method to clicking the *New* button on the *Lights* tab, but it is most useful when you

need to duplicate a light source's
parameters for another light.

AIR

The *Air* tab lets you add atmospheric
effects, such as *Fog* or *Mist*, to your mod-
els. These atmospheric effects are created
in the same manner as the volumetric
effects, *Fog*, *Haze*, and *Mist*, but these
effects are global in nature, and apply to
the entire model. Volumetric effects, in
contrast, are confined to the space occu-
pied by the single-sided objects to which
they are attached.
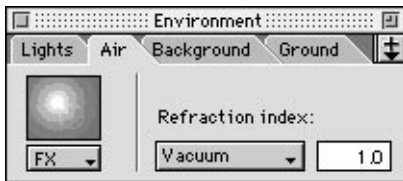
FX. This field allows you to control the
atmospheric effects present in your model.

Refraction index. This field lets you set
an index of refraction for the model. You
can select from one of the presets in the
pop-up list or enter a value directly in this
field.

ADDING ATMOSPHERIC EFFECTS

Hold down the *FX* button, then select an
effect from the *New* sub-menu.

The appropriate dialog appears, allowing
you to define the specific air effect you
want present in your model. For complete
information on creating custom atmo-
spheric effects, *see* **Fog**, **Mist**, *and* **Haze**
beginning on page 165.

Once you've created the effect, it appears
in the center section of the *FX* pop-up
menu with a check beside its name.

EDITING ATMOSPHERIC EFFECTS

All atmospheres currently loaded in the
active model appear in the *Edit* sub-menu.
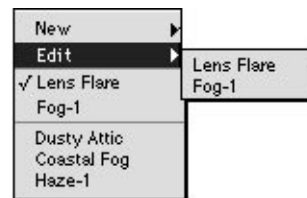
Select the effect you want to edit. The
appropriate dialog appears, allowing you
to modify the current settings.

APPLYING AIR

To apply an atmosphere to your model,
select one from the *Air* pop-up menu.

*Selecting an effect   ...moves it to the center
from the lower section...   with other loaded effects.*
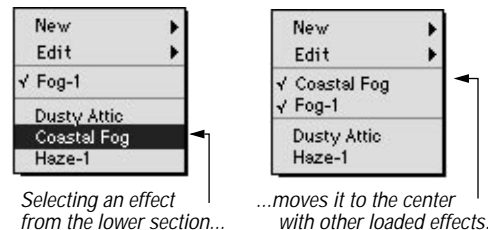
When you select an atmosphere, its name
appears in the center of the menu with a
check beside its name, indicating that it is
currently applied.

REMOVING AIR

To remove an applied atmosphere from the model, select it again to remove the check from beside its name. This will not remove the effect from memory, but it will no longer be applied to the model.

Refraction index. This field lets you set the atmosphere's index of refraction. You can select from one of the presets in the pop-up list or enter a value directly in the numeric field next to the list of presets.

BACKGROUND

Environments add a surrounding reflection and/or background to the scene. By using a background instead of additional modeling, you can minimize the number of objects being used. You can use one background for the visible background and another for the reflections that appear in shiny surfaces. Backgrounds are always placed an infinite distance away from your model.

The background is not visible in the modeling window. The *Visible* and *Reflected* backgrounds are visible only when rendered.

You must render the image with perspective for the background to render properly. If you render in *Orthographic*, the entire background will consist of color information from only one pixel. Therefore, your background will appear as one solid color.

The default visible background for new models is black. You can change the background settings at any time.

A preview of the visible and reflective backgrounds is provided on the right side of the palette.

The *Background* tab lets you customize backgrounds to suit your needs. You can choose from a number of pre-designed backgrounds, or create your own. You can also specify what type of reflective environment, if any, you want to use.

In addition to *Simple Color* and *Horizon* backgrounds, StudioPro also offers *Spherical* and *Cubic* background types. An important difference between spherical and cubic backgrounds is the way light reflects from them. If your model consists of extruded text with a shiny surface applied, for example, you might want to use a cubic background to take advantage of the increased reflectivity it allows. The end result of your rendering may appear quite different, depending on the type of background you choose.
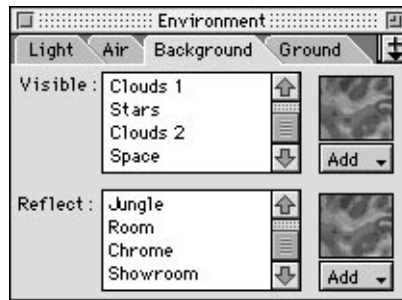
The upper portion of the *Background* tab deals with the visible background, and the lower portion deals with the reflective background.

You can reposition any of the applied backgrounds, either visible or reflected, by simply grabbing the name of the back-

ground and dragging it up or down to the desired position in the list.

Grab a background and drag it to the desired position in the list.
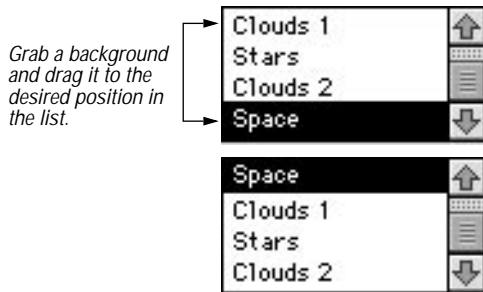
Visible/Reflected buttons. When you hold down either of these buttons, a pop-up list appears.

Center section contains all loaded backgrounds. All checked backgrounds are applied to the active model.

The lower section contains all backgrounds available in the Backgrounds library.
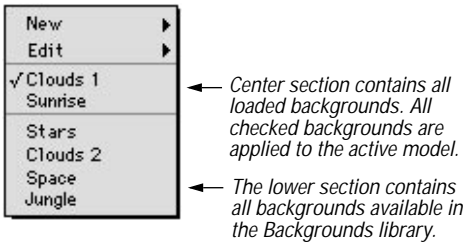
You can create a new background or edit any loaded backgrounds.

CREATING NEW BACKGROUNDS

To create a new background for your model, select *New* from the *Visible* pop-up menu, then choose the type of background you want to create from the sub-menu. You can select to create a *Cubic*, *Horizon*, *Simple Color*, or *Spherical* background.
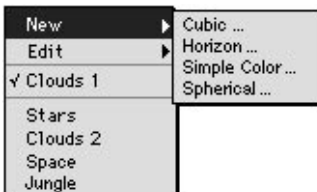
Once you've created a new background, it appears on the Environment Palette and on the upper portion of the Resource Palette. If you want to use this background in other models, you'll need to save it to disk. A special **SAVE** command is provided in the Plus menu on the Resource Palette.

Cubic

Select *Cubic* to create a cubic environment for your model. A cubic environment consists of six different planes: top, bottom, front, back, left, and right. You can use up to six maps, with a different one on each face of the cube.
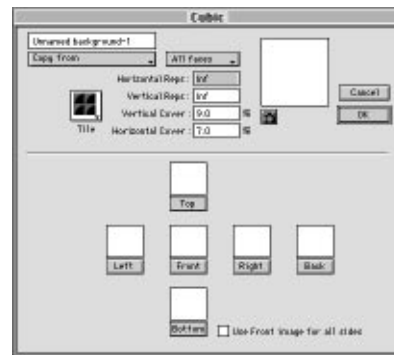
The Cubic dialog allows you to load up to six different images or animations, with a different map on each face. If you want to use the same map on each plane of the background, load the map into the *Front* field and check the *Use Front image for all sides* check box. A default black background will be used for any face that does not contain a map.

This dialog also allows you to change the scale and mapping parameters for each map individually. If you want to use the same scale and mapping parameters for

all maps, select *All Faces* from the pop-up list. For more information on creating cubic backgrounds, *see* **Cubic Background** *on page 180.*

Horizon

Select *Horizon* to create a new sky background.

This dialog allows you to specify colors for the upper and lower areas of the background, as well as colors that appear just above and just below the horizon. An adjustable blend rate allows you to blend the colors with the proper gradation to match the lens angle of the view.

Slow blending uses a linear gradation from the horizon color to the overhead and underfoot colors. The transition from horizon color to sky color is complete within 45° of the horizon line. This is useful for wide angle lens settings.

Medium uses an accelerated linear gradation to complete the horizon color's transition by 33° above or below the horizon line. This is useful for normal lens settings.

Fast uses a logarithmic gradation to complete the color transition by 20° above or

below the horizon line. This is useful for semi-telephoto lens settings.

Simple Color

Select *Simple Color* to define a single color to use as a background. The *Simple Color* dialog appears.

Click the *Color* button to display the *Color Picker* dialog. This dialog allows you to specify a color to use for the visible or reflective background.

Spherical

Select *Spherical* to specify a single image or animation to use as a background. A spherical background consists of a single plane, wrapped around the model on an imaginary sphere, and bunched up at the top and bottom to fit on that sphere.

The *Spherical* dialog lets you load an image or animation, and also allows you to specify the scale and tiling method used. For complete details on creating a new **Spherical Background**, *see page 180.*

EDITING BACKGROUNDS

You can edit any existing background in your model. Select *Edit* from the *Visible* or *Reflected* pop-up menu.

All currently loaded backgrounds appear in the Edit sub-menu.
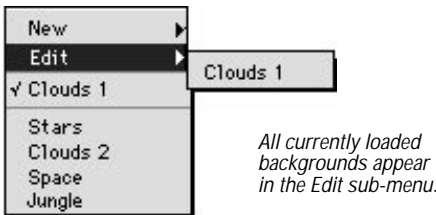
When you select a background to edit, the appropriate dialog appears. For more information on the fields contained in this dialog, *see* **Creating Backgrounds** *on page 180.*

APPLYING BACKGROUNDS

To apply a background to your model, select one from the pop-up list.
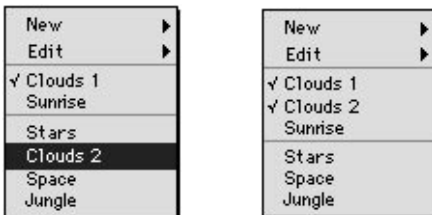
When you select any item from either the center section (loaded backgrounds) or the lower section (backgrounds contained in the library), that background is loaded and, if necessary, and a check is placed beside the name of the background, indicating that the background is currently applied.

REMOVING BACKGROUNDS

Backgrounds that are applied to the model appear with a check beside the background name. To remove a background, select it again; the check is removed, indicating that the background is no longer applied. The background still remains loaded, however. To remove the background from the memory, a **DELETE UNUSED** command is provided in Plus menu on the Resource Palette.

GROUND

The *Ground* tab lets you set up a ground plane for your model. It also lets you apply a texture to the ground plane.

Ground plane. Place a check in this box if you want to use a ground plane in your model. When this box is checked, the Y grid is used as the ground plane for the model. A ground plane is infinite in size, and it cannot be moved.

Texture. You can apply any loaded surface texture to the ground plane. All of the textures that are currently loaded in the active model appear in the *Texture* pop-up list. Select one to apply to the ground plane. StudioPro will render the ground plane with a default plain white texture if no other texture is applied.

Texture Scale. If the texture used on the ground plane contains a map, you can specify its scale. All maps use normal tiling with infinite repetitions.

Edit. Click this button to edit a texture that you've applied to the ground plane. The *Texture Editing* dialog for the selected texture is displayed, and you can modify it as desired.

Plus menu

Click the Zoom box to to toggle between the basic and expanded versions of the palette

The contents of the Object tab changes to reflect the type of object selected.
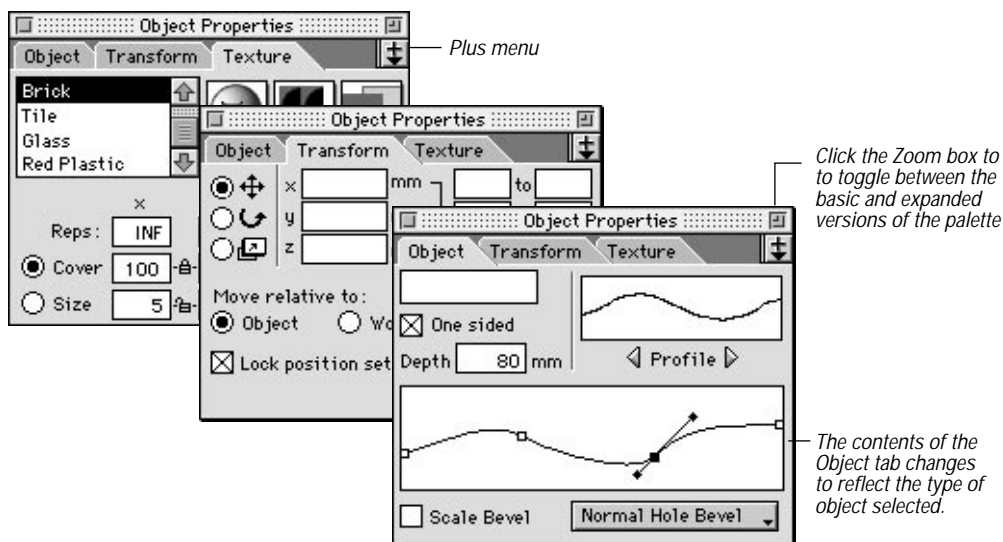
The Object Properties Palette contains all of the information about the currently selected object. You can edit the selected object at any time from this palette.

You can position the Object Properties Palette anywhere on your screen by dragging it by its move bar. This palette floats above the modeling window.

To show the Object Properties Palette, you can use the **SHOW OBJECT PALETTE** command in Windows menu. You can also

click the Object Properties Palette show/hide button on the Button Bar.

Object Properties Palette

To close the palette, select the **HIDE OBJECT PALETTE** command from the Windows menu. You can also close this palette by clicking on the hide/show button on the Button Bar, or by clicking the palette's close box.

The contents of the Object Properties Palette apply to the selected object. If multiple objects are selected, the palette grays out.

If the selected tab contains additional settings, you can expand the Object Properties Palette by clicking the zoom box in the upper right corner of the palette.
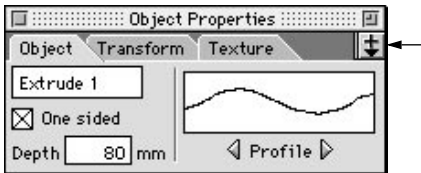
Click the Zoom box to expand the palette to reveal additional settings.
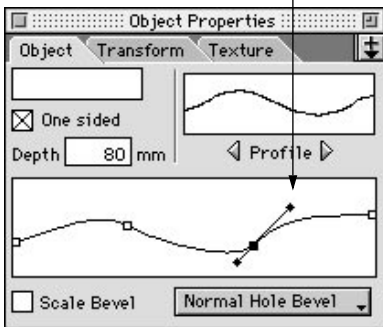
Once expanded, click the *Zoom* box again to reduce it to its basic form.

When you enter text or numeric data from the keyboard, changes take effect when you press the *Enter, Return,* or *Tab* keys or when you click anywhere on the Object Properties Palette outside the field. Other changes to the contents of the palette

(check boxes, radio buttons, etc.) occur immediately.

Plus Menu

This menu contains the following commands:

COLLAPSE PALETTE. This command collapses the palette to display the tabs only.
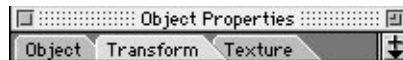
This frees up valuable screen space, but the palette remains available for easy access.

EDIT OBJECT. This command is the same as selecting the **RESHAPE** command from the Modeling menu. For more information, *see* **Reshape** *on page 31.*

The Object Properties Palette contains three tabs. The foremost tab is the active tab. Whenever you click on a tab, it moves to the front and becomes the active tab. You can modify the object at any time by entering new data into any of the palette's editable fields.

OBJECT TAB

The *Object* tab contains information about the specific object type. When you create an object, you can assign a name to the

object by entering a name in the field pro-
vided. Some objects are required to be
named; therefore, these objects are given a
default unique name which appears in
the *Name* field at the time they are cre-
ated. You can change the name at any
time; however, all names must be unique.
The other fields contained on the *Object*
tab differ depending on the type of object
selected.

StudioPro contains many different types
of objects, and each type contains its own
fields. For complete information about the
Object tab for each object type, see the
entry for the tool or command that was
used to create the object.

TRANSFORM TAB

The *Transform* tab allows you to easily and
accurately position and size objects in
your model. Click on the *Transform* tab to
bring it to the forefront.
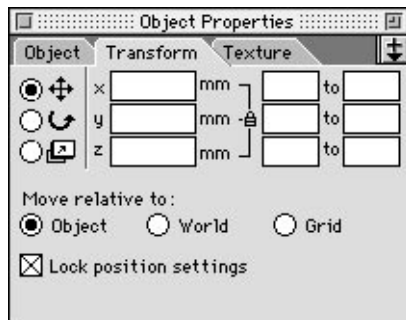
You can specify the range allowed for any
move, rotate, or scale operation. Enter the
values in the fields at the right to use to

restrict the range of each operation (move,
rotate, scale).
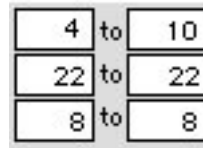
The range indicated is relative to the coor-
dinate system you specify (object, world,
or active grid).

The *Transform* tab also allows you to lock
objects in place so they can't be acciden-
tally moved, rotated, or scaled. This fea-
ture locks the position, rotation, or scale
of the object ONLY; you can still change
the object in other ways, such as reshap-
ing, converting it to other object types,
applying textures, etc.

MOVE

 When the *Move* button is
selected, the X, Y, and Z coordi-
nates for the selected object
appear in the appropriate fields.
You can change the position of
the object on any or all axes.
You can also specify the relative coordi-
nates to which the move applies in the
Move relative to field.

You can select to move the selected object
relative to the *World* (the world grid's 0,0,0
coordinates), the *Object*, or the active *Grid*

(which may or may not be the world grid). To lock the object into position, check the *Lock position settings* check box.

ROTATE

 When the *Rotate* button is selected, you can rotate the selected object on any axis. Enter the number of degrees in the appropriate fields. You can select to rotate the object around the center of the *World* (world grid), the *Object's* origin point, or the active *Grid*.

Check the *Lock rotation settings* check box to prevent the object from being rotated.

SCALE

 When you select the *Scale* button, you can scale the selected object on any axis. You can also choose to scale the object by *Percentage* or by *Size* in the *Scale by* field.

Place a check in the *Lock scale settings* check box if you want to prevent changing the scale of the object.

To scale the object proportionally, click the Lock icon. When the *Lock* icon appears in its locked position, the current proportions of the object is maintained.
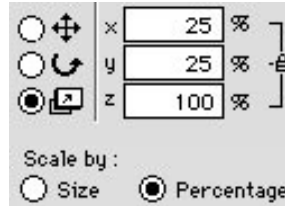
When the Lock icon is in its "locked" position, the object scales proportionally.

When the *Lock* icon is in its "locked" position and you enter a value in one field, the other fields update to maintain the object's proportions.

Each time you click the *Lock* icon, it toggles between its locked and unlocked status.

TEXTURE TAB

The *Texture* tab allows you to control the placement of textures on the selected object. These settings apply to the way the texture appears on the selected object only; they don't in any way affect how the texture appears on other objects. This tab allows you to customize the appearance of the texture on separate objects by mapping it differently.

StudioPro allows you to apply more than one texture to an object. The way in which these textures mix together affects the final appearance of the object when rendered. The *Texture* tab lets you control how those multiple textures mix together.

Click on the *Texture* tab to bring it to the foreground.

List of Applied Textures

This is a list of all the textures applied to the selected object. When you apply a texture to an object, it is placed on top of any other textures that have been applied, and it appears at the top of the list.

You can change a position of the texture in the list by grabbing the name of the texture and dragging it to the desired position in the list.

Grab a background and drag it to the desired position in the list.

This texture now appears in its new position.
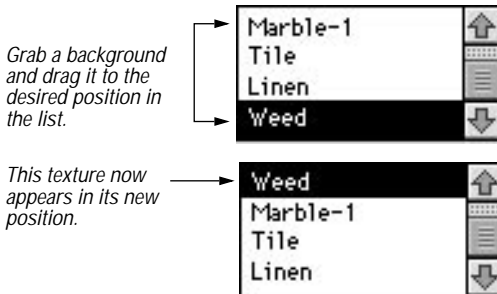
Each texture is mapped separately. Select the texture for which you want to change the mapping parameters.

If the selected texture is a 3-D (or solid) texture, such as *Wood* or *Stone*, several of the fields are dimmed. Because they are three-dimensional in nature, the texture contains no maps. Therefore, the *Mapping*, *Tiling*, and *Mixing* fields are dimmed and unavailable.
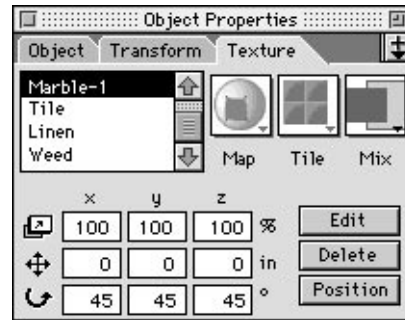
Texture tab, as it appears when a 3-D texture is selected.

Solid (3-D) textures can be positioned interactively by clicking the *Position* button, or you can enter numeric values on this tab to position the texture on the object.

Map

This pop-up list contains several different ways to map a texture:

UV – This method of mapping actually maps the texture onto the object, stretching and squeezing where necessary. Texture maps retain their relative position on the object even when the object is twisted or folded. This is the only method that does not use projection mapping, which is the process of projecting the image onto the surface.

Planar – This method pushes the texture straight through the object. The texture shows on all faces of the object, even the inside and back.

Decal – This method applies the texture to only one side of an object.

Cubic – This method applies the texture from six directions, even if the selected object isn't a cube.

Cylindrical – This method wraps the texture around the object in a cylindrical fashion. If the texture is longer than the object (top and bottom), the texture smears to the center of the object on the top and bottom end caps.

Cylindrical II – This method wraps the texture around the object in the same cylindrical pattern as the Cylindrical mapping type does, except that the end caps are not smeared. Instead, they receive their own face similar to the way cubic works.

Spherical – This method wraps the texture around the object in a spherical manner, and then gathers the texture together at the top and the bottom poles.

Tile

A surface map can be repeated over the surface of an object in different patterns:

Normal. The map repeats in a straight manner, beginning over each time the previous pattern ends.

Mirrored. The image alternates end-for-end each time it repeats across the surface.

None (No tiling). The image appears once at the scale or coverage specified.

Mix

You can specify the rules for mixing multiple textures on an object. These rules apply to all channels of the selected texture. The default setting is *Replace*.

Replace. Replace all other textures with this texture.

Inherit. Inherit all properties of the texture below.

Combine. Combine the settings in the texture above with the settings in the texture below.

Multiply. Multiply the values from this texture with the values in the texture below.

For example, compare the effect of each of the above mixing rules with the colors specified in the *Diffuse Color* fields and the values specified in the *Opacity* fields.

	Diffuse Color	*Opacity*
Texture ABOVE	*Red*	*70%*
Texture BELOW	*Green*	*30%*
Replace	*Red*	*70%*
Inherit	*Green*	*30%*
Combine	*Yellow*	*100%*
Multiply	*Black*	*21%*

Reps

You can specify the number of times to repeat the map across the surface of the object. The default setting is *INF* or infinite in both the horizontal and vertical directions. The *INF* setting ensures that an object will be completely covered no matter how large or small the map is scaled relative to the object.

Cover

This option scales the size of the map to cover a specified percentage of the object. Enter a percentage in both the horizontal and vertical fields. To maintain the proportions of the map, make certain the *Lock* icon is in its locked (closed) position. When locked, you'll only need to enter a value in one field; the value in the second field is determined for you to keep the dimensions of the map proportional.

Size

This option scales the maps as a percentage of the actual size of the map. You can scale the size of the map in both directions. To keep the map proportional, make sure that the *Lock* icon is in its locked (closed) position.

You can edit either the texture itself or the position of the texture with the buttons provided in the lower right corner of the *Texture* tab.

Edit

You can edit the texture by clicking the *Texture* button in the lower right corner of the *Texture* tab. The appropriate *Texture Editing* dialog is displayed.

Delete

To delete the selected texture, click the *Delete* button. This action removes the texture from the object; it does not remove the texture from the model.

To remove the texture from the model, you can use the **DELETE UNUSED** command from the Plus menu on the Resource Palette.

Position

The *Position* button allows you to change the position of the selected texture on the object. Do not confuse positioning the individual textures applied to an object with the process of aligning individual maps within a surface texture definition. Aligning individual maps is accomplished by clicking the *Compose Maps* button at the bottom of the *Surface* texture editing dialog. *(See **Compose Maps** on page 151 for more information about this feature.)*

Clicking the *Position* button is the same as selecting the **EDIT PLACEMENT** command from the Modeling menu.

The Tool Palette changes to display only the tools you need to change the position or alignment of the texture on the object. The top six tools are provided for use on the object itself, and three additional tools are provided for manipulating the texture. The Rendering tool is also provided

for previewing the current placement on the object.

View Move tool — Object Move tool

View Rotate tool — Object Rotate tool

View Scale tool — Object Scale tool

Texture Move tool — Texture Rotate tool

Texture Scale tool

Rendering tool
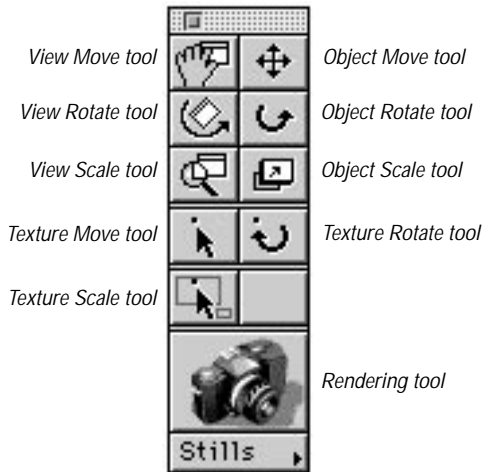
When you click the *Position* button, handles appear on the selected object. You can move, rotate, or scale the texture as desired.

The mapping style affects the appearance of the handles on the selected object.

A special **FIT TEXTURE** button is provided on the Button Bar that allows you to center the texture on the object with 100 percent coverage. This is the default texture orientation. You can use this feature at any time during the texture placement process.

Moving Textures

Select the Texture Move tool to reposition the texture on the object.

Grab a face handle to constrain the movement of the texture perpendicular to the plane of the selected handle.

Grab center handle to move freely in any direction

Grab the center handle to move the texture freely in any direction. It can be placed anywhere on the object.

Rotating Textures

Select the Texture Rotate tool to rotate the selected texture on the object.

Grab any handle and rotate to the desired position

Grab the rotation handles and rotate to the desired position.

Scaling Textures

Select the Texture Scale tool to scale the selected texture on the object.

Changes you make to the scale of the texture are reflected on the *Textures* tab of the Object Properties Palette. Scaling the tex- ture maps affects the way in which the maps tile onto the surface of the object.

When you're finished positioning and aligning the texture on the object, select the **END RESHAPE/EDIT** command from the Modeling menu.

Move bar
Plus menu

Boolean Intersect
Boolean Union
Boolean Subtract
Boolean Cut
Path Extrude
Skin
UnSkin

Resize box

The Extension Tool Palette contains additional tools to use for creating objects and adding special effects to your models.

All of the tools that appear on this palette are extensions. In order to appear on the palette, each tool's extension must be present in the *Strata StudioPro™ Extensions* folder at the time the application is launched. The order in which these extensions tools appear on this palette may vary. This palette is extensible; other tools may be added as they become available, either directly through Strata Inc. or from third-party developers.

You can place this palette anywhere on your screen. To move the palette, drag it by its move bar and position it wherever you want. You can also resize the palette with the Resize box.

To open the Extension Tool Palette, select the **SHOW EXTENSION PALETTE** command in the Windows menu. You can also open

this palette by clicking the hide/show button on the Button Bar.

Show/Hide Extension Tool Palette

To hide the Extension Tool Palette, click the close box in the move bar, or use the **HIDE EXTENSION TOOL PALETTE** command in the Windows menu. You can also hide the palette by clicking its hide/show button on the Button Bar.

The hide/show status and the position of the Extension Tool Palette is remembered between sessions. The next time you launch StudioPro, the palette will appear exactly as it is when you quit the application.

Plus Menu

Commands found in the Plus menu allow you to collapse the palette's size, and also provide information about the tools found on this palette.

Collapse Palette
About Tool...

• **COLLAPSE PALETTE**. Selecting this command reduces the Extension Tool Palette to its minimum size.
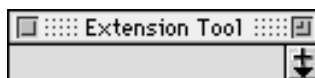
The palette remains readily available, but frees up valuable screen space when not in use.

- **ABOUT TOOL...** This command displays information about the selected tool on the Extension Tool Palette.

BOOLEAN

All of the Boolean tools that appear on the Extension Tool Palette are part of the Boolean extension; therefore, the Boolean extension file must be present in the *Strata StudioPro™ Extensions* folder at the time the application is launched. If the extension isn't present, the Boolean tools will not appear on the palette and cannot be accessed.

In addition to the following Boolean tools, StudioPro also offers you the option of performing Boolean renderings instead. Boolean renderings can simulate objects created with the Subtract and Intersect tools. You can designate an object as "anti-matter" in the Project Window. When the image is rendered, anti-matter objects will not render, nor will any portion of other objects which they overlap. The rendered objects appear as though they were created with the Subtract tool. If two anti-matter objects overlap, only the overlapping portions render; all other portions of the anti-matter objects will not be visible. These rendered objects appear as though they were created with the Intersect tool. Boolean renderings do not change the geometry of objects as do the Boolean tools; they only affect the way in which the objects are rendered.

TOOL FUNCTION

StudioPro provides several tools to perform various Boolean operations: Intersect, Union, Subtract, and Cut. The resulting objects are polygonal meshes.

Boolean Intersect

The Intersect tool creates an object that consists of only the over–lapping portions of two objects. This tool can be used for creating cross-sections of the internal structure of objects and for defining overlapping areas in a model.

First, with the Object Move or Object Rotate tool, position the objects so they intersect in the desired location. Then select the Intersect tool, and click-and-drag to select both objects. When you release the mouse button, the new object is created.
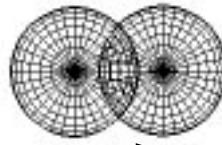
Drag the cursor from one sphere to another with the Intersect *tool...*

to create this single object

The order in which the objects are selected is irrelevant.

If one of the objects is a shape instance, the link to the parent object is broken. Any future changes you make to the shape will no longer affect that object.

Once the Intersect operation is complete, the origin point is placed at the geometric center of the resulting object.

Boolean Union

The Union tool performs a Boolean operation that physically joins two objects at their intersecting points, creating a single, more complex object.

With the Object Move or Object Rotate tool, position the two objects so they overlap as desired. Then, with the Union tool, click-and-drag to select both objects. It doesn't matter which one you select first. When you release the mouse button, the two objects fuse together into one.
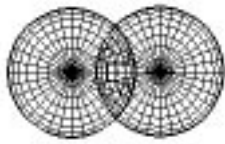
Drag the cursor from one sphere to another with the Union *tool...*
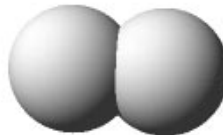
to create this single object

If one of the objects used is an instance of a shape, the link to the parent shape is broken. The object ceases to be an instance, and any future changes made to the shape will not be reflected in that object.

Once the Boolean Union operation is complete, the origin point is placed at the geometric center of the resulting object.

Boolean Subtract

The Subtract tool allows you to remove geometry from an object to create holes, indentations, or voids. This is accomplished by completely removing the geometry of an object from a model, taking with it that portion of any object sharing the same space.

When using the Subtract tool, the order of selection is very important. First, position the objects so they overlap as desired with the Object Move or Object Rotate tool. Then, with the Boolean Subtract tool, select the object you want to use to subtract geometry. Drag to highlight the second object from which geometry will be subtracted.
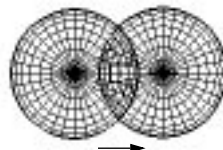
Drag the cursor from one sphere to another with the Subtract *tool...*

to create this single object

The overlapping section of the first object is always subtracted from the second object.

If one of the objects is an instance of a shape, the link to the parent shape is broken, and any future changes made to the shape will not be reflected in that object.

Once the Boolean Subtract operation is complete, the origin point is placed at the geometric center of the resulting object.

Boolean Cut

The Cut tool creates a new shape by deleting all of both objects except that part of the first object which is inside the second object.

The Cut tool is similar to the Intersection tool, except that the object created with the Intersection tool consists of the overlapping sections of BOTH objects; with the Cut tool, the final object consists of only the overlapping portion of the FIRST

object. And, unlike the Subtract tool, the Cut tool does not supply any additional surfaces. Therefore, a sphere cut by another sphere results in a bowl-shaped object.

With one of the Object Manipulation tools (Object Move or Object Rotate), position the objects so they intersect in the desired location. Then select the Cut tool, and click-and-drag to select the objects.
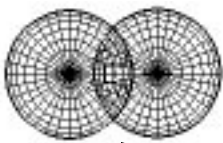
Drag the cursor from one sphere to another with the Cut tool...

to create this single object

The order in which you select the objects is very important. Only the overlapping portion of the SECOND object remains.

If you use the Cut tool with a shape instance, the link to its parent shape is broken, and no future modifications to the parent will be reflected in that object.

Once the Boolean Cut operation is complete, the origin point is placed at the geometric center of the resulting object.

EDITING POLYGONAL MESHES

You can edit the resulting mesh object with the **RESHAPE** command in the Modeling menu. This command allows you to push and pull individual vertex points on the surface of the object. *See* **Reshape** *on*

page 31 for complete details on this command.

Object Properties Palette

You can also edit the properties of the mesh object on the *Object* tab of the Object Properties Palette.
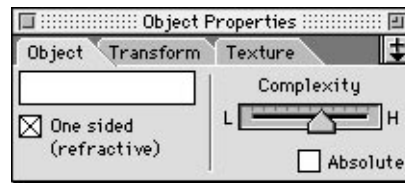
- **Name**. This field contains the name of the selected mesh object, if a name has been assigned. You can change the name at any time in this field.

- **One sided**. This check box indicates whether the object is one-sided or two-sided. You can convert it from one type to another by checking or unchecking this box.

    If you are planning to apply a transparent texture with refractive properties, or a volumetric effect such as *Mist* or *Fog*, you'll need to create a solid, one-sided object. One-sided surfaces are only visible to the rendering algorithms from one side; double-sided objects are visible from either side.

    Transparent objects with single-sided surfaces refract light coming through them as if the objects were solid, such as a solid crystal ball. Objects with double-sided surfaces appear hollow, like a hollow glass shell, and cannot refract light.

- **Complexity slider**. The position of this slider determines the complexity, or amount of detail, with which the object is rendered, either in the modeling window or in the final image. It does NOT change the actual complexity of the object, but only the way the renderers display it.

- **Absolute check box** - When this box is unchecked, the slider indicates a relative complexity based on the maximum allowed by that renderer. The range of complexity is also affected by the size of the object and its proximity to the view plane.

  When this box is checked, the *Complexity* slider indicates the EXACT percentage of the maximum complexity allowed by each renderer.

SKIN

Skin is an extension tool; therefore, the Skin extension file must be present in the *Strata StudioPro™ Extensions* folder at the time the application is launched. If the extension isn't present, the Skin tool will not appear on the palette and cannot be accessed.

The Skin tool lets you create a surface over two or more ribs. The ribs of the resulting object can be animated.

TOOL FUNCTION

There's no limit to the number of ribs you can use, depending on the amount of memory available. Any 2-D object can be used as a rib. The ribs do not have to contain the same number of edges or vertices. One rib can be a rectangle and one a circle.

Select the Skin tool, then select the objects to be skinned. The skin surface appears as soon as the ribs are selected.
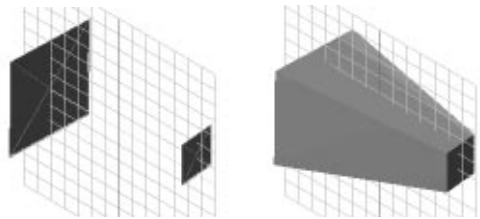
The order in which you select the ribs determines the final shape of the skin object.

The order in which you select these ribs determines the geometry of the final skin object.
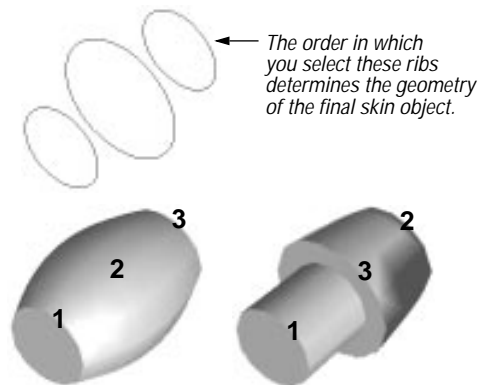
EDITING SKIN OBJECTS

Each rib can be animated independently either before or after the skinning process.

To animate the ribs after skinning, select the skin object and then select the **RESHAPE** command from the Modeling menu, or click the **RESHAPE** button on the Button Bar. The **RESHAPE** command lets you move, rotate, or scale the ribs of the skin object.

To push or pull individual points on the skin object, you must first convert it to Bézier or polygonal mesh. Once converted, you can then use the **RESHAPE** command to edit the vertex points. However, once converted to another object type, it cannot be converted back into a skin object again.

To edit the 2-D ribs of a skin object, you must first unskin the object by selecting Unskin tool on the Extension Tool Palette. You can then select the rib(s) you want to modify and select the **RESHAPE** command from the Modeling menu. This allows you to edit the size, shape, or location of any of the ribs.

For more information on the **RESHAPE** command, *see page 31*.

Object Properties Palette

You can also edit the skin object on the *Object* tab of the Object Properties Palette.
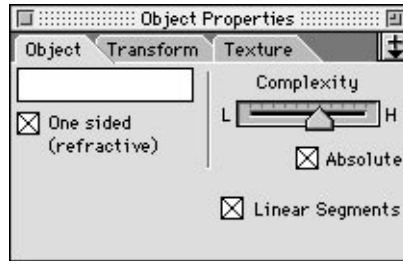
- **Name**. This field contains the name of the Skin object, which can be edited if desired. If no name has been assigned, you can add one at any time.

- **One sided**. A check mark in this box indicates the selected Skin object is a solid, one-sided object. If no check appears in this box, the selected Skin object is a hollow, two-sided object. You can change the Skin object from solid to hollow, or vice versa, at any time.

  If you are planning to apply a transparent texture with refractive properties, or a volumetric effect such as *Fog* or *Mist*, the Skin object must be a solid, single-sided object.

  Single-sided surfaces are only visible to the rendering algorithms from one side; double-sided objects are visible from either side.

- **Complexity slider**. The position of this slider determines the complexity, or amount of detail, with which the Skin object is rendered, either in the model-

ing window or in the final image. It does NOT change the actual complexity of the object, but only the way the renderers display it.

- **Absolute check box** - When this box is *unchecked,* the slider indicates a relative complexity based on the maximum allowed by that renderer. The range of complexity is also affected by the size of the object and its proximity to the view plane. For example, if the Skin object appears at a substantial distance in the background, a lesser complexity level will be used.

  When this box is *checked,* the *Complexity Slider* indicates the EXACT percentage of the maximum complexity allowed.

For information on the other tabs on the Object Properties Palette, *see* **Object Properties Palette** *on page 197.*

UNSKIN

UnSkin is part of the Skin extension tool; therefore, the Skin extension file must be present in the *Strata StudioPro™ Extensions* folder at the time the application is launched. If the extension isn't present, the UnSkin tool will not appear on the palette and cannot be accessed.

The Unskin tool lets you remove the skin between any two ribs.

Select the Unskin tool, then select the segment from which you want to remove the skin. When you select the segment, it appears highlighted. When you release the mouse button, the skin disappears.

PATH EXTRUDE

Path Extrude is an extension tool; therefore, the Path Extrude extension file must be present in the *Strata StudioPro™ Extensions* folder at the time the application is launched. If the extension isn't present, the Path Extrude tool will not appear on the palette and cannot be accessed.

The Path Extrude tool allows you to extrude a 2-D object along a pre-designated path to create a 3-D shape.

TOOL SETTINGS

You can change the default behavior of this tool. To access the *Tool Settings* dialog, double-click on the Path Extrude tool.
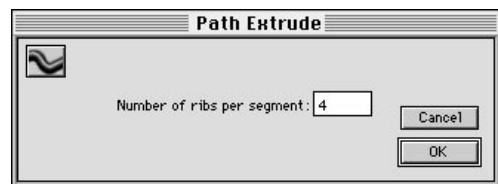
- **Number of ribs per segment**. When an object is created with this tool, ribs are placed between the control points along the path. You can specify the default number of ribs that are placed between these points.

TOOL FUNCTION

Use any single 2-D object as a template for the extrusion. It can be filled or hollow, open or closed. The Path Extrude tool cannot be used with grouped objects.

Draw or import a Bézier line to use as a path for the extrusion. The direction the line is drawn determines the direction the object moves along the path, from its beginning point to its ending point. The template is always extruded perpendicular to the path.

You can animate the path and/or template before extruding, and all of the animation information will be retained.

To perform the extrusion, drag the template to the path. When you release the mouse button, the extrusion occurs along the path.
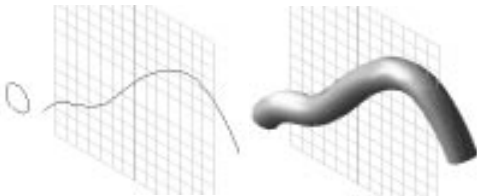
Always select the template first, then the path. The order of selection is extremely important.

EDITING A PATH EXTRUDE OBJECT

To edit either the path or the template of an object created with the Path Extrude tool, select the **RESHAPE** command in the Modeling menu.
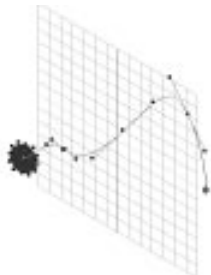
When you select this command, direction handles appear on the control points of both the template and the path, and you can edit either 2-D object as desired.

For more information, *see* **Reshape** *on page 31.*

If you want to push or pull individual vertices on the final Path Extrude object, you must convert it to a mesh. *See* **Convert** *on page 42* for more information.

Object Properties Palette

You can also edit the selected Path Extrude object on the *Object* tab of the Object Properties Palette.
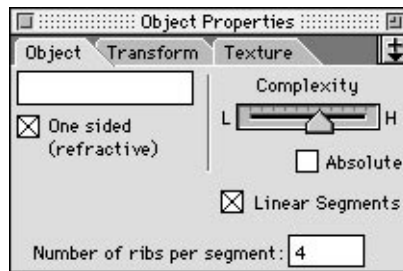
- **Name**. This field contains the name of the selected Path Extrude object, which can be edited if desired.

- **One sided**. A check mark in this box indicates the selected Path Extrude object is a solid, one-sided object. If no check appears in this box, the selected object is a hollow, two-sided object. You can change the Path Extrude object from solid to hollow, or vice versa, at any time.

  If you are planning to apply a transparent texture with refractive properties, or a volumetric effect such as *Fog* or

Mist, the Path Extrude object must be a solid, single-sided object.

Single-sided surfaces are only visible to the rendering algorithms from one side; double-sided objects are visible from either side.

- **Complexity slider**. The position of this slider determines the complexity, or amount of detail, with which the Path Extrude object is rendered, either in the modeling window or in the final image. It does NOT change the actual complexity of the object, but only the way the renderers display it.

- **Absolute check box** - When this box is *unchecked*, the slider indicates a relative complexity based on the maximum allowed by that renderer. The range of complexity is also affected by the size of the object and its proximity to the view plane. For example, if the Path Extrude object appears at a substantial distance in the background, a lesser complexity level will be used.

When this box is *checked*, the *Complexity Slider* indicates the EXACT percent-

age of the maximum complexity allowed.

- **Linear segments**. When this box is checked, the areas between segments contain flat surfaces, creating a ridge-like appearance. When this box is unchecked, the areas between segments create a smoothly curved surface

← *Path and template*

Compare the difference in these two objects. The object on the bottom was created with linear segments.
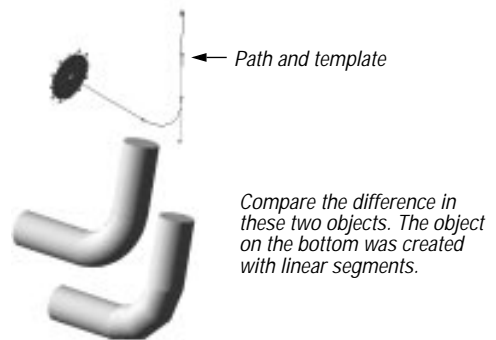
- **Number of ribs per segment**. This field indicates the number of ribs placed between each segment.

For information on the other tabs on the Object Properties Palette, *see* **Object Properties Palette** *on page 197.*

Model Statistics
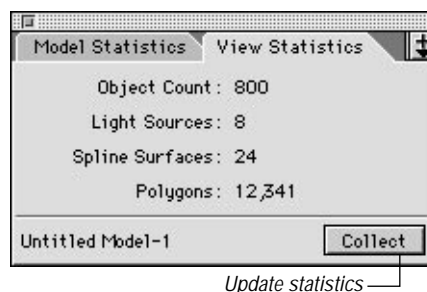
View Statistics

```
Model Statistics  View Statistics
        Object Count: 1,003
        Light Sources: 16
        Spline Surfaces: 47
            Polygons: 35,000

Untitled Model-1              Collect
```

```
Model Statistics  View Statistics
        Object Count: 800
        Light Sources: 8
        Spline Surfaces: 24
            Polygons: 12,341

Untitled Model-1              Collect
```

Name of active model   *Plus menu*

Update statistics

The Statistics Palette displays important information about the active model. This information includes the number of objects, light sources, spline surfaces, and polygons. This information is helpful when you're trying to determine the amount of RAM you need to successfully render the images in your model.

This palette floats above all model windows and can be positioned anywhere on the screen. To move it, simply drag it by its move bar. Its hide/show status is retained between sessions, so if it is open when you quit the application, it will be open when you launch StudioPro the next time.

The name of the active model appears in the lower left corner of the palette. Select the **SHOW STATISTICS PALETTE** command from the Windows menu to display the Statistics Palette. To close the palette, select **HIDE STATISTICS PALETTE** from the menu. You can also close the palette by clicking the Close box.

This palette contains two tabs. When the *Model Statistics* tab is active, the information displayed relates to the entire model. When the *View Statistics* tab is active, the same information is displayed, but it relates to the active view only.

Click the *Collect* button to update the data contained on this palette. The information does not continually update.

You can collapse the palette to display the tabs only by selecting the **COLLAPSE PAL-ETTE** command from the Plus menu. This allows you to free up valuable screen space while leaving the palette readily available for reference purposes, when needed.

```
Model Statistics  View Statistics
```
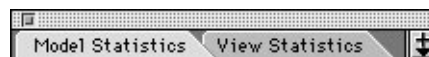
Once collapsed, you can expand it again by selecting **EXPAND PALETTE** from the Plus menu.
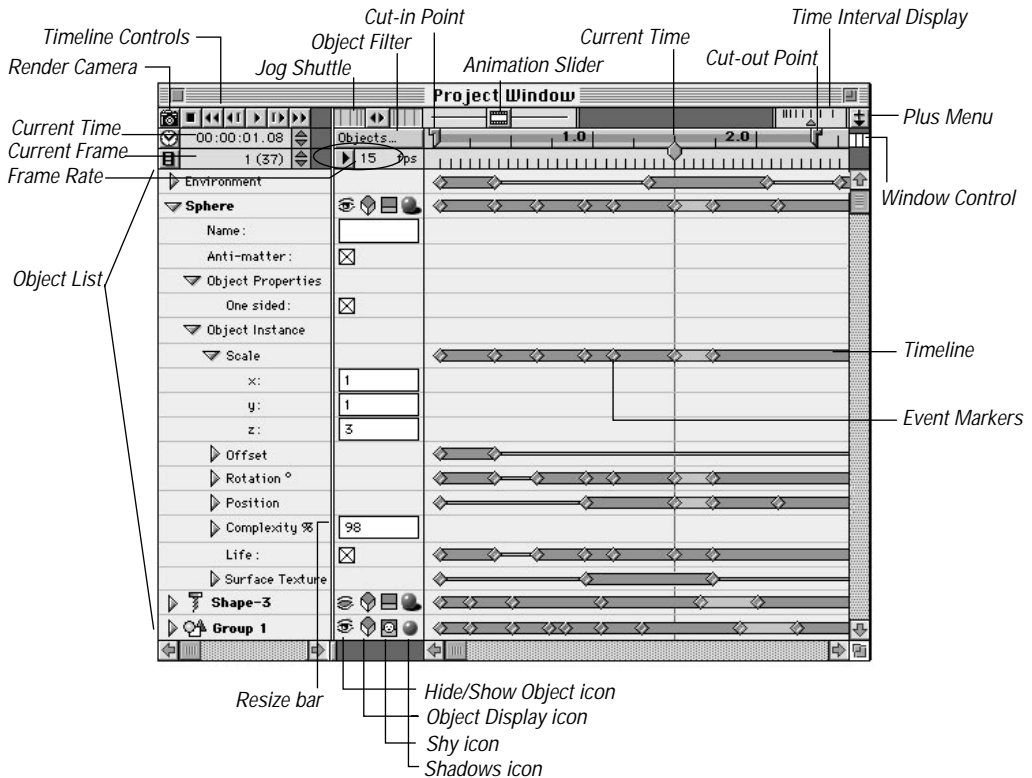
The Project Window provides another means of controlling the objects in your model. You can do many of the same things in the Project Window that can be done in the modeling window. You can select, position, and scale objects, control animations, etc.

The Project Window is another method of displaying the data contained in the active window. If a Shapes window is active, the Project Window contains information about the contents of that Shape window. If the modeling window is active, the contents of that window is reflected in the Project Window.

All of the controls you need to create an animation are located in the Project Window. Objects, light sources, and cameras can all be animated.

The Project Window floats in front of the modeling window, but it can be covered by other palettes. If another palette overlaps it, simply click on the Project Window to bring it to the front again.

This palette contains the standard window controls found on all desktop windows, including a title bar, close box, zoom box, resize box, and scroll bars.

You can size and position the Project Window anywhere on the desktop. The resize box works both horizontally and vertically. Notice there are two separate scroll bars at the bottom of the window. You can scroll through each section separately. A resize bar is also provided so that your can increase or decrease either side of the window.

In addition to resizing the Project Window with the scroll bars or with the resize box, controls are also provided for collapsing portions of the window.

A pop-up list appears that lets you change the way the Project Window is displayed.
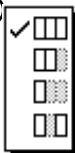
This option displays all three sections of the Project Window.

You can choose not to display the animation portion of the Project Window.

This option displays the first two sections only
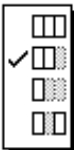
This option still allows access to the objects in your model, and you are still able to edit them.

You can display only the left section of the window. You can still select objects in your model in this display mode.

This option displays the first section only

You can display the object list and the animation portion of the Project Window.

This option displays these sections only.

The upper section on the window contains controls for creating and previewing your animations.

 Rendering tool lets you render your animation directly from the Project Window. When you click this button, the *Render* dialog appears. This is the same as selecting the **RENDER** command from the Rendering menu. *See* **Render** *on page 51* for more information about this command.

Timeline controls allow you to move around in your animation, or preview any portion of the animation in wireframe.

Stop
Go to Cut-in point
Go back one frame
Preview
Go forward one frame
Go to Cut-out Point
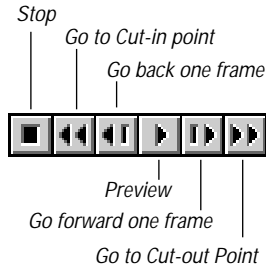
When you click on one of these buttons, the *Current Time* pointer repositions itself to the location indicated by the button.

Jog Shuttle moves the animation forward or backward from your current position.

Dragging the Jog Shuttle slider slightly to the left displays frames before the current frame. Dragging it to the right displays frames after the current frame. Moving the shuttle closer to the center moves the animation slower; moving the shuttle further from the center moves the animation faster.

Animation Slider allows you to move to a specific position relative to the Cut-in and Cut-out points.

Moving the slider all the way to the left displays the beginning frame (Cut-in point), and dragging the slider all the way to the right displays the last frame of the animation (Cut-out point). The Current Time field updates to show your new position in the animation.

Time Interval Display allows you to control the time intervals displayed in the Project Window. You can condense or expand the time displayed in the Project Window with this control.

Cut-in point marks the position on the timeline where you want the rendered animation to begin. There can be animation scripted before this point.

Cut-in point · *Cut-out point*
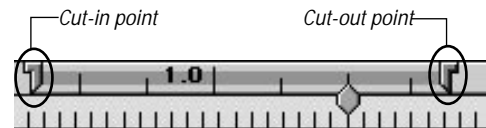
Cut-out point marks the position on the timeline where you want the rendered animation to end. There can be animation scripted after the cut-out point.

Current Time Pointer marks the position of the current time. Drag the pointer to the desired position with the cursor or adjust it with the *Timeline* controls.

Current Time Pointer
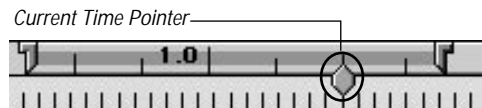
Current Time displays the position of the current time marker on the animation timeline. The time is displayed in SMPTE (Society for Motion Picture and Television Engineers) time code.

Minutes *Seconds*
Hours *Frames*
00:00:01.12
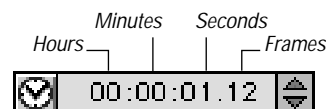
Frames are numbered according to the actual time it takes to reach that point from the first frame.

If you change the value in this field, the *Current Time* pointer moves along the timeline to the specified time. You can change the time by using the spinner controls to the right of the time code. You can also change the current time in this field by entering a new time directly from the keyboard.

Object filter allows you to specify the types of objects that are listed in the Project Window.

Objects...

When you click this button, a dialog is displayed.

You can choose to display all of the objects in your model, or only specific object types.

Current Frame displays the frame number at the position of the current time marker.

Current frame   *Total number of frames*

There are several ways to move to a different frame:

- Use the *Timeline* control buttons to move forward or back any number of frames.
- Manually drag the *Current Time* pointer to another frame.
- Use the spinner controls to move forward or backwards to other frames.
- Enter the number of the frame you want to move to in the Current Frame field.

Frame Rate field displays the current frame rate setting. You can enter a value in this field, or select one from the *Frame Rate* pop-up list. This list contains several of the most commonly-used frame rates.

OBJECTS
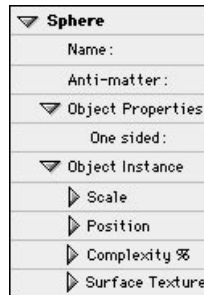
Object list. All of the objects in your model appear in this hierarchical list, including cameras and light sources. You can select objects in your model from this section of the Project Window. When you select an object here, it becomes selected in the model, and vice versa. To select multiple objects, hold down the Shift key as you click the objects,

If the object has not been named, its object type appears in the Object list.

Object type

No name

If the object has been named, it appears in the Object list by that name. You can add a name or change the existing name in the Project Window or on the Object Properties Palette.

Name appears in both places

A right arrow next to the object name (or object *Type*, if unnamed) indicates that more information is available. Click the arrow to display information about the object.

PROPERTIES

You can edit any of the object's properties from the Project Window. Different attributes have different editable parameters.

Any of the data in the text entry fields can be edited. You can also change the status of any of the check boxes.

Text entry fields
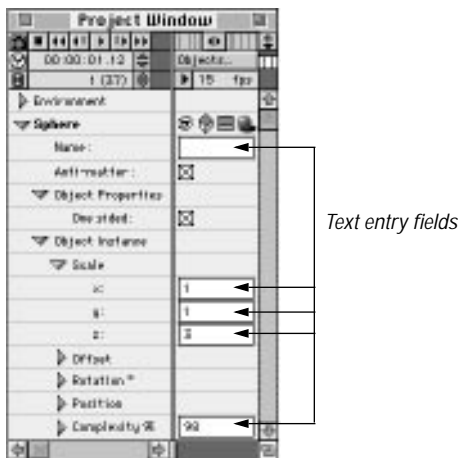
Hide/Show icon is used to hide or show the object in BOTH the modeling window and the rendering. Click icon to toggle between states.

Display method icon determines how the object appears in the modeling window. You can display the object according to the display method selected in the modeling window, or as a wireframe bounding box. This setting overrides the display method selected in the modeling window. Click the icon to toggle between display methods.

Shy icon determines whether or not the object appears in the modeling window and/or in the rendering. Each time you click the icon, it cycles through the various states.

Display in modeling window and rendering.

Appears in rendering but not in modeling window.

Display in modeling window, but don't render. This option is used mainly for construction geometry.

Shadow icon determines whether or not the object renders with shadows.

Force shadows on this object, even if disabled elsewhere - overrides other settings.

Suppress shadows on this object.

Don't override settings elsewhere.

The *Force Shadows* and *Suppress Shadows* icons override any other settings. However, even when the *Force Shadows* icon is selected, shadows only appear if the rendering algorithm used is capable of ren-

dering shadows. Click the *Shadow* icon to cycle through the various states.

Life check box indicates whether or not the object exists in the model at the time indicated by the *Current Time* pointer.
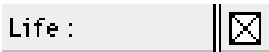
Life : ⊠

By changing the status of this check box, an object can appear and disappear at any time during the course of an animation.

The *Life* checkbox does not automatically appear as a property of an object unless you specifically add this attribute. To add a *Life* checkbox, select *Life* from the **ADD ATTRIBUTE** command in the Plus menu on the Project Window.

Anti-matter check box indicates the status of the object. However, for anti-matter to have any effect, it MUST be created as a one-sided object.

Anti-matter ⊠

When this box is checked, StudioPro performs a Boolean rendering operation. Do not confuse Boolean rendering with actual Boolean operations.

When performing a Boolean rendering, StudioPro does not create the geometry which accompanies Boolean operations; it only calculates which portions of the object appear when rendered.

The *Anti-matter* object itself will not render, nor will any portion of other objects that it overlaps. This rendering effect

appears the same as an actual Boolean Subtract operation.

If two *Anti-matter* objects overlap, the overlapping portions will render. ONLY the overlapping portions render; all other portions of the anti-matter objects will not be visible when rendered. This rendering effect *appears* the same as an actual Boolean Intersect modeling operation.

Animation

This section of the Project Window is used for scripting animations. If any of the properties of an object are capable of changing over time, an associated timeline appears next to the property name in the *Animation* section of the window.

Animation Timeline represents any animation that is associated with the object.
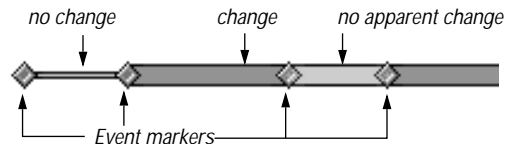
The appearance of the timeline indicates whether or not any changes take place between event markers. Any changes that are not apparent are indicated by a lighter color on the timeline.

An object's motion is determined by its animation path. In most cases, it is apparent when changes occur because each

event marker indicates a new position along the path.
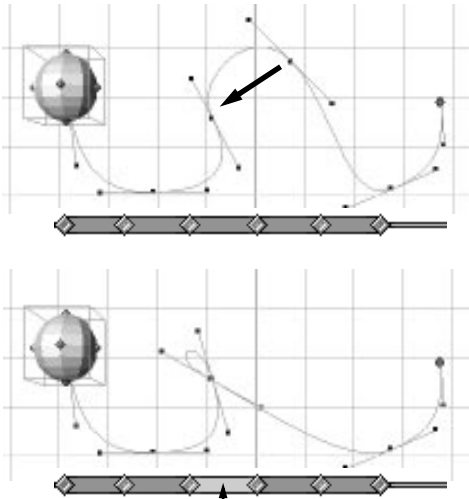
This indicates that a change occurs even when both markers represent identical positions in space.

An example of an unapparent change is illustrated above. If you place one event marker on top of another marker, both markers indicate the same position in space. However, the force exerted by the direction handles still require that Studio-Pro interpolate the motion between event markers. This type of change is indicated on the timeline by its lighter color.

Event markers are used to script the animation paths of objects, light sources, or objects in a model. Event markers are created as objects are positioned, rotated, scaled, or given textures. Event markers are also created for light sources as they are positioned, rotated, given gels, and adjusted for illumination intensity.

The following actions can be scripted to occur over time:

• **Position** – You can move an object from one location to another over time. The speed is determined by the distance it travels and the time given for it to move.

• **Rotation** – You can rotate an object on any axis or combination of axes over time. The speed of the rotation is determined by the angle specified between event markers and the time given for the rotation.

• **Scale** – You can change the size of the object over time.

• **Life** – The *Life* check box allows you to specify whether or not the object exists in the model at any given time. By changing the status of this check box, an object can appear and disappear at any time during the course of an animation

• **Reshape** - You can reshape a Bézier object at different time intervals so that its shape changes over time.

    NOTE *If you want to change the shape of an object over time, it must be a Bézier object. When you reshape a polygonal object, the object maintains its new shape at all points along the timeline.*

• **Texture** – You can change the texture of an object over time. It can be changed as often as you wish. You can use a QuickTime movie in a texture definition, as well.

You can modify the texture itself to change over time. The *Texture Editing* dialog provides an *Edit At* field that allows you to define how the texture appears at any given point in time.

- **Effects** - Effects can also be edited so that the changes occur at different times. The *Effects* dialogs all provide an *Edit At* field that allows you to define the parameters of the effect for any given time.

- **Camera focal length** – You can change the camera window's focal length over time.

- **Light intensity** – The intensity of light sources can be changed over time. This includes directional/global lights as well as spotlights and point lights.

- **Background** – You can change the background environment over time by loading a animation to "play" as a background in your model.

Selecting Event Markers

Event markers are selected by clicking them. Selected event markers appear red. You can select multiple event markers by holding down the Shift key while clicking each marker icon, or by dragging a marquee around the event markers you want to select. However, multiple selections must be from only one object, and they must be contiguous.

When you select an event marker, it does not automatically move the time pointer to that position on the timeline. If you hold down the Command key while clicking an event marker, the time pointer moves to that position, and all modeling views redraw to show the model at that point in time.

Editing Event Markers

To edit an event marker, select the marker, then select the **EDIT EVENT MARKER** command from the Plus menu, or double click the event marker in the Project Window. An *Event Options* dialog appears, allowing you to specify the time at which you want this event marker to be placed. This allows you to move the marker, with all its associated data, to any location along the timeline.

If the selected event marker defines the motion of an object on an animation path, you can also change its motion as it passes through the marker. In this case, you can also double click the event marker on its animation path in the modeling window to open the *Event Options* dialog.
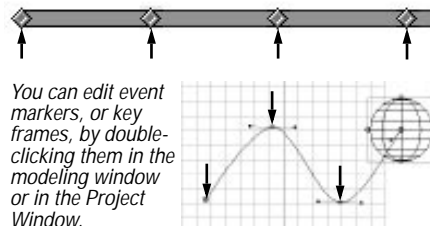
You can edit event markers, or key frames, by double-clicking them in the modeling window or in the Project Window.

The *Event Options* dialog appears, allowing you to control the velocity of the object as it passes through the selected marker.
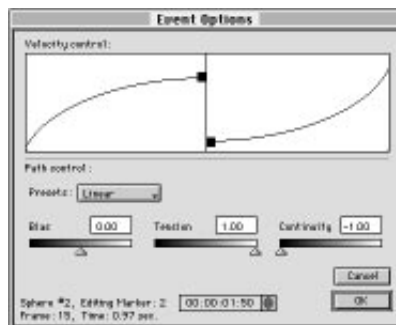
In addition to editing the position of the event marker on the timeline, additional fields are provided for velocity and path control.

Velocity Control. Use this control to define the velocity of the object as it passes through this event marker. The velocity window on the left defines the velocity of the object as it arrives at the event marker, and the window on the right defines the velocity of the object as it leaves the event marker. These controls allow you to realistically simulate inertia resulting from the object's mass, or other physical motion effects such as a collision or the bounce of a ball.

Velocity In　　　　*Velocity Out*

Grab the left handle and drag up or down to define the velocity of the object as it approaches the event marker.

Grab the right handle and drag up or down to define the velocity of the object as it leaves the event marker.
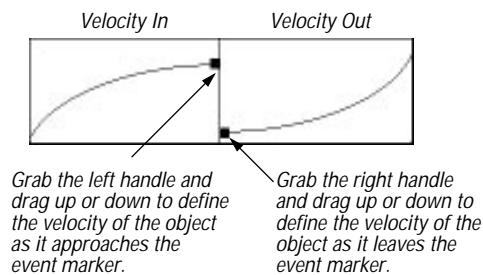
Path Control. The lower section of the dialog contains controls that affect the animation path.

• **Presets**. When you select one of the presets from this pop-up list, the settings in this dialog update to reflect your selection.
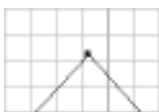
Selecting Linear from the Presets pop-up collapses the handles, causing straight, angular motion as the object passes through this point on its animation path.

The *Bias*, *Tension*, and *Continuity* settings control the movement of the object as it passes through the event marker. Acceptable values for each of these sliders range from -1.00 to 1.00.

• **Bias**. This setting can be used to represent the effect of exaggerating a movement by overshooting the key frame.

High　　　　*Medium*　　　　*Low*
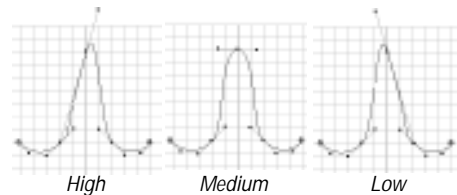
• **Tension**. This field is used to adjust how taut the spline path flows from one event marker to the next. A setting of 1.00 is equivalent to a linear path.

High　　　　*Medium*　　　　*Low*
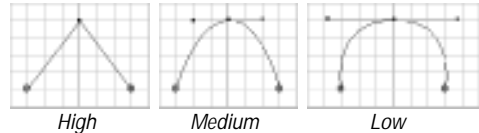
• **Continuity**. This setting determines how evenly the motion appears as the object travels through this event marker on the animation path.
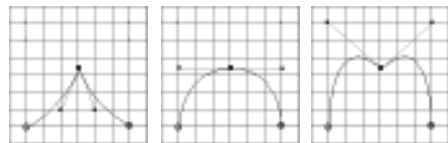
Examples of varying degrees of continuity.

Moving Event Markers

You can move the event markers along the timeline to change the object's pacing or its sequence in the animation. However,

you can't move event markers from one object line to another.

Deleting Event Markers

To delete an event marker, select it and then select the **DELETE EVENT MARKER** from the Plus menu on the Project Window. You can also delete a selected marker by using the **DELETE** command in the Edit menu or by pushing the Delete key.

Modifier keys that apply to event markers:

• **Shift key** extends the selection of event markers on the palette. Multiple event markers may be selected at one time for copying, deleting or moving in unison.

• **Option key** leaves original event marker in the original location and creates a copy of that event marker as you drag it to a new location.

• **Command key** moves the time pointer to the position of the event marker when you click to select it.

Plus Menu

The Plus menu contains commands that apply to the Project Window.

COLLAPSE WINDOW. This command collapses the Project Window to display only the title bar. This allows you to free up valuable screen space, but still have the window readily available when needed.

PREVIEW ANIMATION. This command lets you preview the animation in the modeling window.

ADD ATTRIBUTE. This command allows you to add an additional attribute to the selected object in the Project Window. Select an attribute from the command's pop-up menu.

• *Life* - This option adds a *Life* attribute to the object. It will appear in the hierarchy, under the object, in the Project Window. You can then specify whether or not the object exists at that moment in time on the animation timeline.

• *URL* - This option adds a *URL* address field to the selected object in the Project Window. Then, when the model is saved in VRML format, the URL address is saved with it. The address appears as a property of the object in the Project Window.

DELETE ATTRIBUTE. To delete an existing attribute, select it from this command's sub-menu.

NEW EVENT MARKER. This command inserts an event marker at the current position of the time pointer on the selected timeline. This command is available when the time pointer is not positioned on an existing event marker.

For example, if you want to ensure that the object maintains its position at the current time, select *Position* from the object's list of attributes. Then select this command from the Plus menu. An event marker is placed on the timeline, marking the object's current position. This allows

you to generate an "anchor" event marker so that the object can make a sudden change later in time. Anchor-type event markers are used to keep later event markers from causing the object to change before you want it to.

EDIT EVENT MARKER. Event markers define the motion of an object on an animation path. You can change the motion of an object as it passes through each event marker on the animation path.

When you choose this command, the *Event Options* dialog appears for the selected event marker, allowing you full control over the motion of the object on the animation path. For complete information, *see* **Editing Event Markers** *on page 226.*

DELETE EVENT MARKER. This command allows you to delete the selected marker from the selected timeline.

Close box — Title bar — Zoom box

Untitled-1

Isometric | Wireframe |

View Grid Button

Plus Menu

View Orientation

Display Method

Perspective Selector

Maximize View Button

Split View Control

Split View Control

Resize box
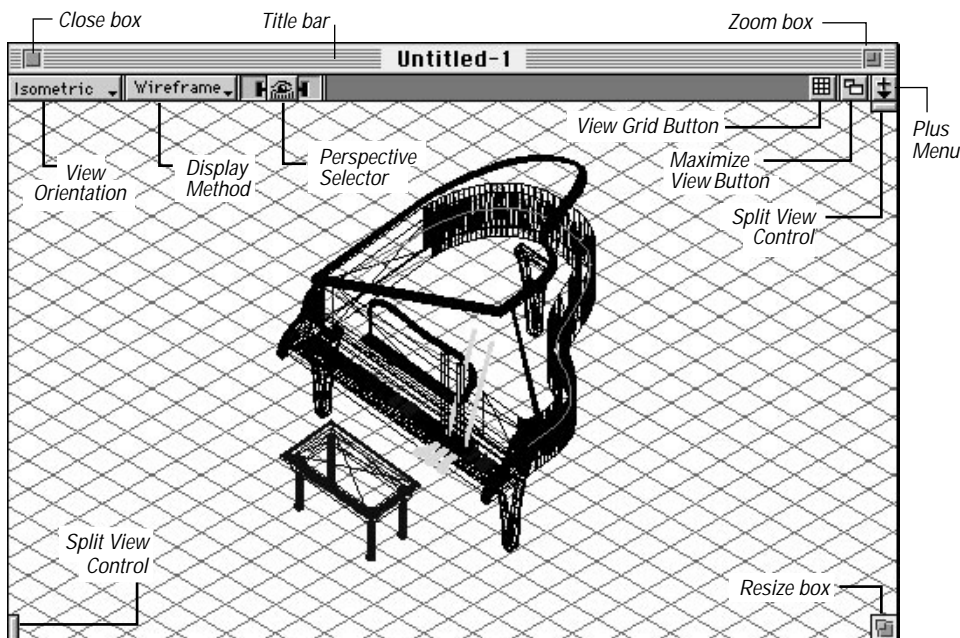
The modeling window is the most commonly used window in StudioPro. It contains the standard Macintosh interface elements, as well as some specialized controls to adjust the way objects are displayed.

You can resize the modeling window and position it anywhere on the screen. It contains one or more views of the model's three-dimensional space. The space occupied by the model is unlimited in size.

When you select the **NEW** command from the File menu, a modeling window opens

for the new model. The **OPEN** command in the File menu opens the model with the same modeling windows that were open at the time the file was last saved.

MODELING WINDOW CONTROLS

The modeling window provides controls that allow you to customize the way in which you view your model.

- **Title Bar** – You can reposition the modeling window anywhere on your desktop by grabbing the title bar and dragging it to another location.

• **Close box** – To close the modeling window, click the Close box in the upper left corner. This is the same as selecting the **CLOSE** command from the File menu.

  A least one window must remain open for a model to remain open. Closing the last window of a model closes the model as well.

• **Zoom Box** – To expand the modeling window to fill the available screen space, click the Zoom Box in the upper right corner. Click the Zoom Box again to reduce it back to its original size.

• **Resize Box** –The size of a modeling window is completely adjustable. You can click-and-drag the Resize box in the lower right corner to manually set the size of the window.

In addition to the standard Macintosh controls described above, each view contains its own set of specialized controls. The settings within each view are independent of any other views.

• **Split View Control** and **Split View Bar** – You can split the window into multiple view panes by grabbing a *Split View Control* and dragging it to the desired size.
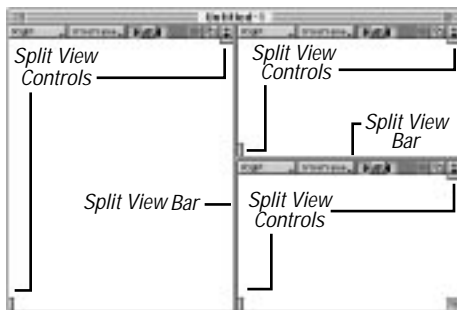
The Tab key allows you to cycle through all of the views in the window. The Shift+Tab keys allow you to cycle through the views in reverse order.

To resize the view pane, drag the *Split View Bar* to the desired position.

You can also split the active view in half by double-clicking on one of the *Split View Controls.* If the size of the active view is too small to split, the system beep sounds.

Each view pane has its own set of controls, allowing you to view your model from several different angles at once. You can also specify a different display method for each view.

To delete a view pane, drag its split bar to the edge of the window.

• **View Orientation** – Use the pop-up menu to choose the direction from which you want to display your model. You can choose from seven different preset positions.
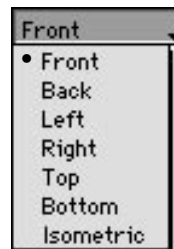
If you customize the view by rotating it with the View Move tool, *Custom* appears in the view title area. To return again to a preset position, simply click on one of the view orientation titles.

The Option+Tab keys allow you to cycle through the various orientations within the active view. The Shift+Option+Tab keys allow you to cycle though the orientations in the view in reverse order.

• **Display Method** – A list of the available display methods appears in this pop-up list. Select the desired display method from the menu.
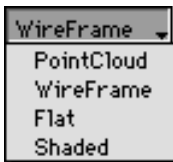
• **Perspective Selector** – You can choose to display the view in orthographic (no perspective), normal perspective, or wide angle perspective.

Orthographic

Normal
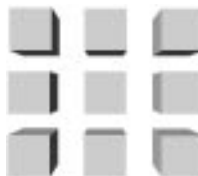
Wide angle
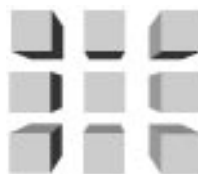
Views without perspective display the model in an orthographic projection. Parallel lines of objects in the model appear parallel in the view. The objects always appear their true size relative to one another.

Perspective adds the element of depth to views. Objects closer to the view plane appear larger than those farther away. Views with perspective appear more natural, because this is the way your eye sees images in the real world.

• **View Grid Button** – Each view contains a View Grid button. Unlike other grids in StudioPro, these grids are view-relative; therefore, they track when you move in the window. They are drawn parallel to the view plane with a coordinate system of 0,0,0. *See* **Grids** *on page 234*.

• **Maximize View Button** – Click this button to maximize the view. Then, to return to the window's previous state, click the button again.

Plus Menu

The Plus menu is located in the upper right corner of each view. It contains entries that are context-sensitive.

The following commands appear in the modeling window's Plus menu.

PREVIEW ANIMATION. Use this command to preview the animation in the view.

NEW WINDOW FROM VIEW. This command opens a new window with the same configuration as the view.

NEW CAMERA FROM VIEW. This command inserts a new camera in your model. The view is what's seen in the camera's window.

SPLIT VIEW. This command splits the view in half vertically or horizontally, depending on which dimension is larger. It is the same as double-clicking on either of the Split Bars in the modeling Window.

REMOVE VIEW. This command removes the view from the modeling window.

DISPLAY OBJECTS. This command lets you set the level of detail displayed in the view. The sub-menu allows you to choose the display detail. The higher the level, the less detail displayed in the window.

A mark next to the menu entry indicates the current display detail. The detail level you select affects all models globally until you change it again with this command. Your selection is retained from session to session.

The *Normally* setting displays all objects in the model in full detail. Use this setting to see exactly how each object appears.

If your model is so complex that the redraw times begin to take an extra long time, you can choose to display the objects as fast boxes. Fast boxes are essentially bounding boxes that represent the size and proportions of each object. This reduces the amount of time required for the redraw.

Each level setting moves the point at which fast boxes appear further down the hierarchical structure. If you choose *1 Level*, objects in the model appear normal, but shapes in the model appear as fast boxes; *2 Level*, first level shapes display normally, but any second level shapes display as fast boxes; and so on. The level you choose should depend on how interested you are in viewing sub-parts of shapes.

This command doesn't affect renderings in any way. If you're using fast boxes for displaying objects in the modeling windows, they will still render the scene in full detail.

RENDER. Use this command to open the *Render* dialog and begin the rendering process. This is the same as the **RENDER** command in the Rendering menu. *See* **Render** *on page 51* for complete details.

GRIDS

Grids allow you to more accurately create and position the objects in your model. StudioPro has three different types of

grids to use in your modeling: world grids, user-defined grids, and view grids. Each one provides a special purpose.

All modeling takes place on the active grid only. However, you can change grids at any time, even in the middle of drawing or inserting an object in your model.

Only one grid can be active in a view at a time. The inactive grids are dimmed.

To hide the grids, select the **HIDE GRIDS** command from the Edit menu. When this command is enabled, the view grid becomes the active grid, even though it is hidden. When the grids are hidden, a check appears beside the command name in the menu.

To display the grids, select the **HIDE GRIDS** command again. The grid that was active when you chose the command becomes the active grid again, and the check is removed from beside the command name in the menu.

World Grids

There are three world grids to use for modeling in 3-D space. Each appears a different color; the Z grid is tan, the Y grid is blue, and the X grid is purple.

By default, each new model opens with Y grid as the default grid. This grid appears blue. The center of the grid represents 0,0,0 in 3-D space. You can define the default grid in the *Preferences* dialog. *See* **Preferences** *on page 23* for more information.

World grids are displayed at a specific size, but they are actually infinite in size. The **SET UNITS** command determines the units and subdivisions used for world grids. *See* **Set Units** *on page 20.*

The following hotkeys are provided for selecting any of the three world grids:

- **X key** selects the grid perpendicular to the X axis. It appears purple in the modeling window.

- **Y key** selects the grid perpendicular to the Y axis. It appears blue.

- **Z key** selects the grid perpendicular to the Z axis. It appears a tan color.

In addition to the X, Y, and Z hotkeys, you can also use the plus (+) or minus (-) keys to cycle forward or backward through all world and user-defined grids.

NOTE *You should note that ALL modeling occurs on the active grid. Therefore, if the active grid appears edge-on, or nearly edge-on, you may want to switch to a different grid. Also, be cautious when moving objects in a NEARLY edge-on orientation to the active grid. When moving objects in this orientation, what appears to be a very short distance may actually be an extremely long distance. You may want to change the view orientation before moving objects to achieve more predictable results.*

Resizing World Grids

To resize a world grid, select the Grid tool from the Tool Palette. You can increase or

decrease the visible portion of the world grid, but they can't be rotated or moved.

Use any handle to resize the grid to the desired size.
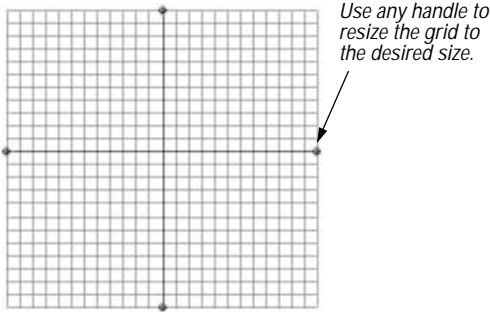
Grab a side handle and drag to resize it. You can only size the *visible* portion of the grid; it is actually infinite in size.

View Grids

Unlike other grids in StudioPro, these grids are view-relative; therefore, they track when you move in the window. View grids fill the entire modeling view; they cannot be resized.

Each view in the modeling window contains a *View Grid* button. Clicking the button inserts a grid in the active view.

View Grid button

Clicking the button again returns to the grid that was last active.

You can select the *Use View Grids Always* option in *Preferences* dialog if you prefer. For more information on this option, *see* **Preferences** *on page 23*.

When you select the **HIDE GRIDS** command from the Edit menu, the view grid becomes the active grid, even though this grid is also hidden. All modeling is done relative to the active view.

View grids are drawn parallel to the view plane with a coordinate system of 0,0,0. View grids appear gray in color.

User-defined Grids

You can create your own grids with the Grid tool. User-defined grids appear orange. They are attached directly to an object and can be positioned anywhere in your model.

Like all grids in StudioPro, user-defined grids are infinite in size, but you can resize the visible portion of the grid. You can also rotate, tilt, or move user-defined grids.

You can cycle forward or backward through the user-defined grids with the Option-Plus or Option-Minus keys. To cycle through both the user-defined grids AND world grids, use the plus (+) or minus (-) keys (without the Option key).

For more information on user-defined grids, *see* **Grid tool** *on page 128*.
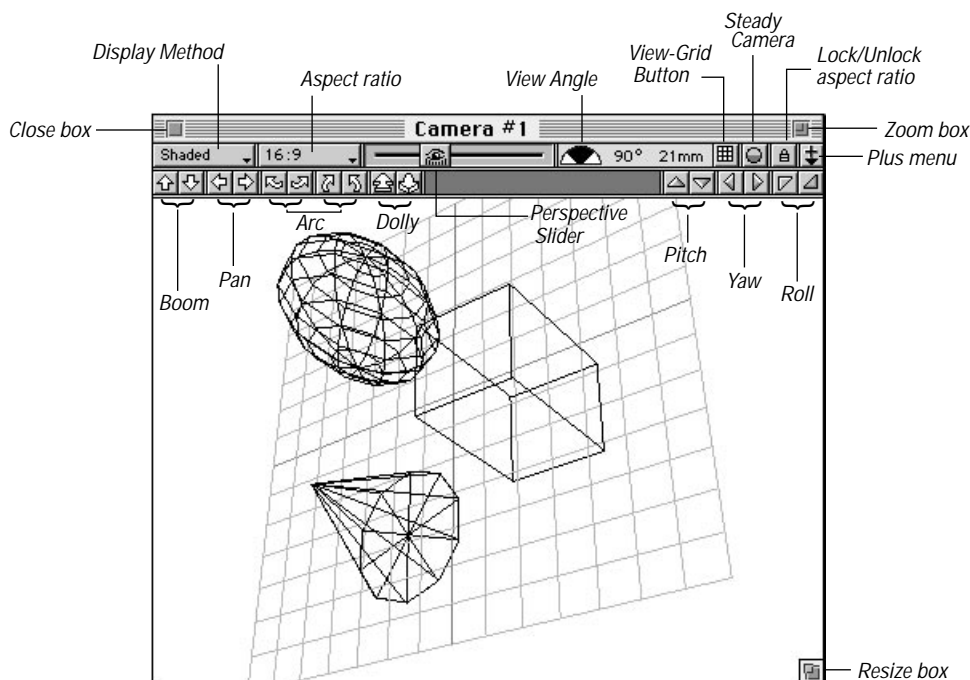
Each camera object you insert in your model has its own camera window. When you look at your model from a camera window, it's as though you are actually viewing it through the camera's view-finder.

To view the model through the camera window, double-click on the camera object's icon in the modeling window, or select the camera object by name from the **CAMERA WINDOW** command's pop-up menu in the Windows menu.

Camera windows are similar to Modeling windows, but they are linked to the

camera objects. Each camera can contain only one view; camera windows cannot be split.

The following controls, found at the top of the camera window, allow you to have full control over the behavior of the camera:

- **Display method**. Select a display method from the pop-up list.

- **Aspect ratio**. This field indicates the ratio of the width of the camera window to its height.

- **Perspective slider**. The perspective slider on the camera window is fully variable, instead of the three-position perspective selector on the modeling window. The slider control is located horizontally across the top of the window frame.

When positioned to the far left, the camera window view is at maximum telephoto, which translates into essentially no perspective at all. When positioned to the far right, the camera window is at ultra-wide angle. The view angle is so extreme in perspective that objects appear distorted.

- **View Angle**. This reflects the current position of the perspective slider, which can range anywhere from one degree to less than 180 degrees. When the slider is positioned to the right, the camera window appears as if viewed through a wide-angle lens. Moving the slider to the left increases the tele-photo effect.

- **View Grid**. Each camera view contains a *View Grid* button. Unlike other grids in StudioPro, these grids are view-relative; therefore, they track when you move in the window. They are drawn parallel to the view plane with a coordinate system of 0,0,0. View Grids appear gray in the camera window.

- **Steady Camera**. When this option is enabled, the camera's "up" vector always remains in the "up" position. Click the button again to disable this option.

- **Lock/Unlock**. You can lock the aspect ratio so that resizing the window prevents the ratio from changing.

- **Control buttons**. Use these buttons to control the position of the camera.

   Boom. The Boom controls move the camera up or down, relative to the position of the target object.

   Pan. The Pan controls move the camera left or right, relative to the position of the target object.

   Arc. These controls move the camera in an arc around the target object.

   Dolly. The Dolly controls move the camera toward or away from the target object.

   Pitch. Use these controls to tilt the camera along its X axis. If *Steady Camera* is enabled, these controls cannot be accessed.

   Yaw. These controls tilt the camera along its Y axis.

   Roll. These controls tilt the camera along its Z axis. If *Steady Camera* is enabled, the *Roll* controls are unavailable.

Plus Menu

This menu provides easy access to commonly used commands that relate to the Camera window.
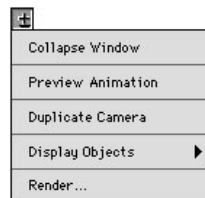
COLLAPSE WINDOW. Use this command to collapse the window to display only the title bar. This allows you to free up valuable screen space, yet still keep the window readily available, if needed. Once the window is collapsed, the command changes to **EXPAND WINDOW**.

PREVIEW ANIMATION. This command lets you preview the animation.

DUPLICATE CAMERA. This command makes an exact copy of the current camera. Unless you give the new camera a name, StudioPro uses the current name and appends a number to the end.

DISPLAY OBJECTS. Select the level of detail displayed in the camera window from the sub-menu. The higher the level, the less detail displayed in the window.

A mark next to the menu entry indicates the current display detail. The detail level you select affects all models globally until you change it again with this command. Your selection is retained from session to session.

The *Normally* setting displays all objects in the model in full detail. Use this setting to see exactly how each object appears.

If your model is so complex that the redraw times begin to take an extra long time, you can choose to display the objects as fast boxes. Fast boxes are essentially bounding boxes that represent the size and proportions of each object. This reduces the amount of time required for the redraw.

Each level setting moves the point at which fast boxes appear further down the hierarchical structure. If you choose *1 Level*, objects in the model appear normal, but shapes in the model appear as fast boxes; *2 Level*, first level shapes display normally, but any second level shapes display as fast boxes; and so on. The level you choose should depend on how interested you are in viewing sub-parts of shapes.

This command doesn't affect renderings in any way. If you're using fast boxes for displaying objects in the modeling windows, they will still render in full detail.

RENDER. Use this command to open the *Render* dialog and begin the rendering process. This is the same as the **RENDER** command in the Rendering menu. *See* **Render** *on page 51* for complete details on this command.

Adjusts the spot-
light's area of
illumination

Name of
selected
spotlight

Steady Spotlight

View Grid

Close box

Spotlight #1

Zoom box

Plus menu

Shaded   110°

Control buttons

Resize box

The Spotlight window is provided to assist you in accurately positioning spotlights in your model. After inserting a spotlight into your model, you can open the Spotlight window and "see" which objects are illuminated by the light.

The Spotlight Window provides the following controls:

• **Slider**. You can use the slider at the top of the window to reduce or increase the area illuminated by the spotlight.

• **Name**. The name of the spotlight is displayed at the top of the window; however, the name cannot be edited here. If you want to change the name of the spotlight, you can do so on the Object Properties Palette.

- **Control buttons**. Use these buttons to control the position of the spotlight. From this window you can clearly see what portion of the model the spotlight is illuminating. The following buttons are provided for positioning the spotlight:

  Boom. The Boom controls move the spotlight up or down, relative to the position of the target object.

  Pan. The Pan controls move the spotlight left or right, relative to the position of the target object.

  Arc. These controls move the spotlight in an arc around the target object.

  Dolly. The Dolly controls move the spotlight toward or away from the target object.

  Pitch. Use these controls to tilt the spotlight along its X axis. These controls are unavailable when the *Steady Spotlight* option is enabled.

  Yaw. These controls tilt the spotlight along its Y axis.

  Roll. These controls tilt the spotlight along its Z axis. Normally, rotating a spotlight has no apparent effect. However, if a gel containing an image map has been applied to the spotlight, you may want to rotate the gel. The gel itself cannot be rotated, but rotating the spotlight has the same effect. These control are disabled when the *Steady Spotlight* option is enabled.

- **Resize box**. Resizing the window enlarges, or magnifies, the view. It does not enlarge the range of illumination.

- **View Grids**. When *View Grids* is enabled, all modeling occurs relative to the active view. To disable *View Grids*, click on the button again.

- **Steady Spotlight**. When this option is enabled, the spotlight always maintains its "up" position, relative to world coordinates. To disable this option, click on the button again.

Plus Menu

This menu provides easy access to commonly used commands that relate to the Spotlight window.

COLLAPSE WINDOW. Use this command to collapse the window to display only the title bar. This allows you to free up valuable screen space, yet still keep the window readily available, if needed. Once the window is collapsed, the command changes to **EXPAND WINDOW**.

DUPLICATE SPOTLIGHT. This command makes an exact copy of the current spotlight. Unless you give the new spotlight a name, StudioPro uses the current name and appends a number to the end.

DISPLAY OBJECTS. Select the level of detail displayed in the spotlight window from the sub-menu. The higher the level, the less detail displayed in the window.

A mark next to the menu entry indicates the current display detail. The detail level you select affects all models globally until you change it again with this command. Your selection is retained from session to session.

The *Normally* setting displays all objects in the model in full detail. Use this setting to see exactly how each object appears.

If your model is so complex that the redraw times begin to take an extra long time, you can choose to display the objects as fast boxes. Fast boxes are essentially bounding boxes that represent the size and proportions of each object. This reduces the amount of time required for the redraw.

Each level setting moves the point at which fast boxes appear further down the hierarchical structure. If you choose *1 Level*, objects in the model appear normal, but shapes in the model appear as fast boxes; *2 Level*, first level shapes display normally, but any second level shapes display as fast boxes; and so on. The level you choose should depend on how interested you are in viewing sub-parts of shapes.

This command doesn't affect renderings in any way. If you're using fast boxes for displaying objects in the spotlight windows, they will still render in full detail.

RENDER. Use this command to open the *Render* dialog and begin the rendering process. This is the same as the **RENDER** command in the Rendering menu. *See* Render *on page 51* for complete details on this command.

Continuous rendering feedback

Activity indicator

Estimated time to render

Progress bar

Refresh button

Untitled Snapshot

00:01:35

Plus menu

300 × 200 pixels

Size of image
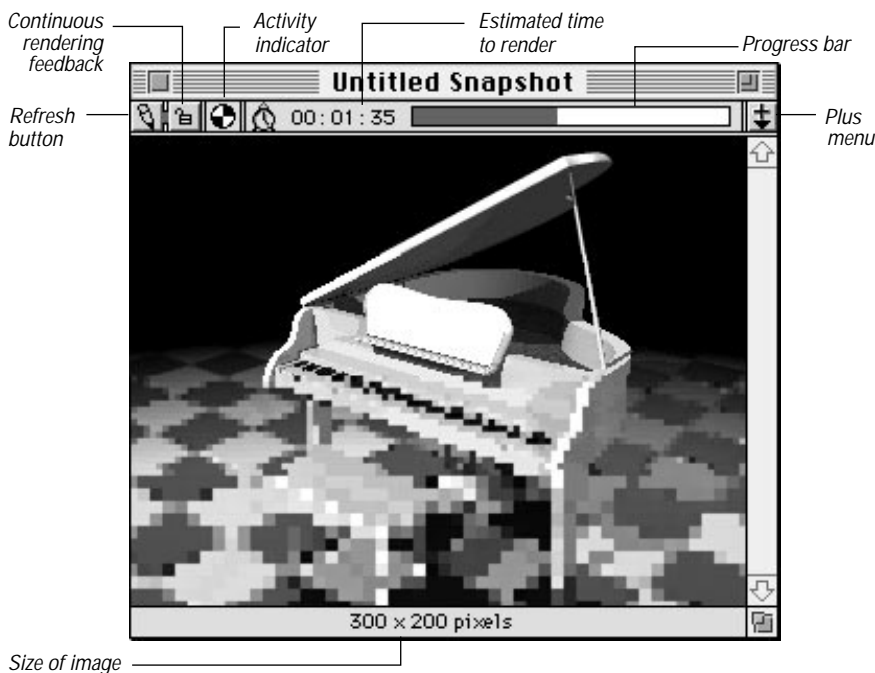
RENDERING SNAPSHOTS

When you begin a rendering, StudioPro opens a separate rendering window. You can think of a rendering as simply taking a photograph of your model. You may watch the image develop, if you wish, by turning on the preview option. Turning off the preview option, however, speeds up the rendering process.

A rendering window contains some specific controls that are unique to this type of window. These controls allow you to watch the rendering process as it occurs.

If the size of the image being rendered is larger than the screen, you can use the scroll bars or the resize button to view hidden areas of the window.

A rendering window can be moved around the screen as it is rendering. It can also be moved to the background, even though the rendering continues.

An explanation of the specialized controls follows:

- **Refresh button** – With the continuous rendering feedback turned off to speed up the rendering process, you can update the rendering window as often as desired by clicking the refresh button. Each time you push the button, the image redraws once in its current state.

- **Continuous rendering feedback** – Click the *Lock* icon to display in a "locked" position to continuously update the image, in real time, as it is being rendered. This option may significantly slow the rendering process. To decrease the time required for rendering, click the *Lock* icon so that it appears in an "unlocked" position.

- **Activity indicator** – This control is located to the right of the refresh button. Its appearance is similar to a "beach ball." The ball rotates as the image renders. The speed at which the ball rotates is an indication of rendering speed.

- **Estimated time to render** – A estimate of the time required to complete the rendering is displayed and continuously updated in the feedback portion of the window. The time is displayed in minutes and seconds or in hours and minutes, depending on the interval of time. Keep in mind, though, that this is just an estimate.

- **Progress bar** – The bar moves to the right as the rendering proceeds in the window. StudioPro makes a "best estimate" of the amount of work completed at any point during the rendering process. When the bar reaches the right edge of the window,

the beach ball stops turning, and the rendering is complete.

Plus Menu

The Plus menu contains frequently used commands that pertain to the Rendering window.
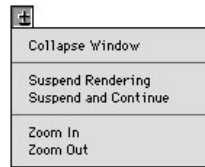
COLLAPSE WINDOW. Use this command to collapse the window to display its title bar only. This allows you to free up valuable screen space while leaving the rendering accessible for future use.

SUSPEND RENDERING. Use this command to save a rendering in progress. You can then restart it later and continue rendering. This command is the same as selecting the **SUSPEND RENDERING** command from the Rendering menu. For a full description of this command, *see* **Suspend Rendering** *on page 66.*

SUSPEND AND CONTINUE. Use this command to save the rendering in its current state of completion, and then automatically continue on with the rendering process. This is the same as choosing **SUSPEND AND CONTINUE** from the Rendering menu. *See also* **Suspend and Continue** *on page 67.*

ZOOM IN. Use this command to zoom in on the rendering at the center of the view.

ZOOM OUT. Use this command to zoom out.

SNAPSHOT WINDOW

When the rendering completes, the system beep sounds. The Rendering window converts to a Snapshot Window. The rendering controls are replaced with information about the rendered image. This information includes the time required to render, file size, dimensions of the image, resolution, and color depth.

Color depth of image
Resolution of image
Dimensions of image
File size of image
Time to complete rendering
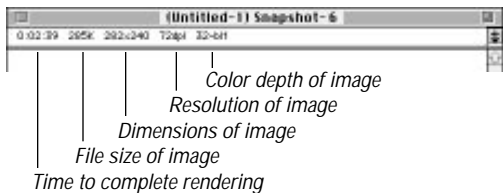
Basically, a snapshot is an unsaved rendering. Once you save a snapshot, when you open the file, it is then placed in an Image window.

If you start and complete a rendering in the same session (without suspending and restarting), the rendering remains in a Snapshot window until you close it or until you quit StudioPro. When you close your model, you will be asked if you want to save the snapshot if it hasn't already been saved.

NOTE *If the rendering required less than 30 seconds to complete, StudioPro assumes the rendering was for preview purposes only, and you will not be asked if you want to save before closing.*

The image will save automatically if you queue the rendering. This can be done either by choosing the *Suspend* option in the *Render* dialog or by using the **SUS-**

PEND RENDERING command from the Rendering menu on an in-progress rendering.

RENDERING ANIMATIONS

When rendering animations, the Rendering window has one additional control. In addition to the time estimate (for the total animation), additional numbers appear between the time estimate and the progress bar. These numbers indicate the current frame being rendered and the total frames to render.

Current progress
Actual frame numbers
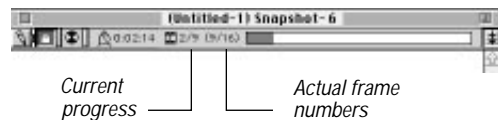
If the animation you're rendering is actually a sub-set of the total frames in the animation, two sets of numbers appear. The first set indicates how many frames have completed rendering, out of the total number of frames being rendered. The second set (in parenthesis) show where the frames being rendered occur in the entire animation sequence.

In the previous illustration, nine frames are being rendered: frames eight through 16. Currently, two of the nine frames have completed rendering. The numbers in the parenthesis indicate the actual frame number, frame nine, that is currently rendering, and the last frame number to be rendered is frame 16.

When an animation has completed rendering, the Rendering window converts to an Animation window. *See* **Animation Window** *on page 251.*

Dimensions, in pixels

Memory size ——

Piano

2412K 800×600 72dpi —— *Resolution*
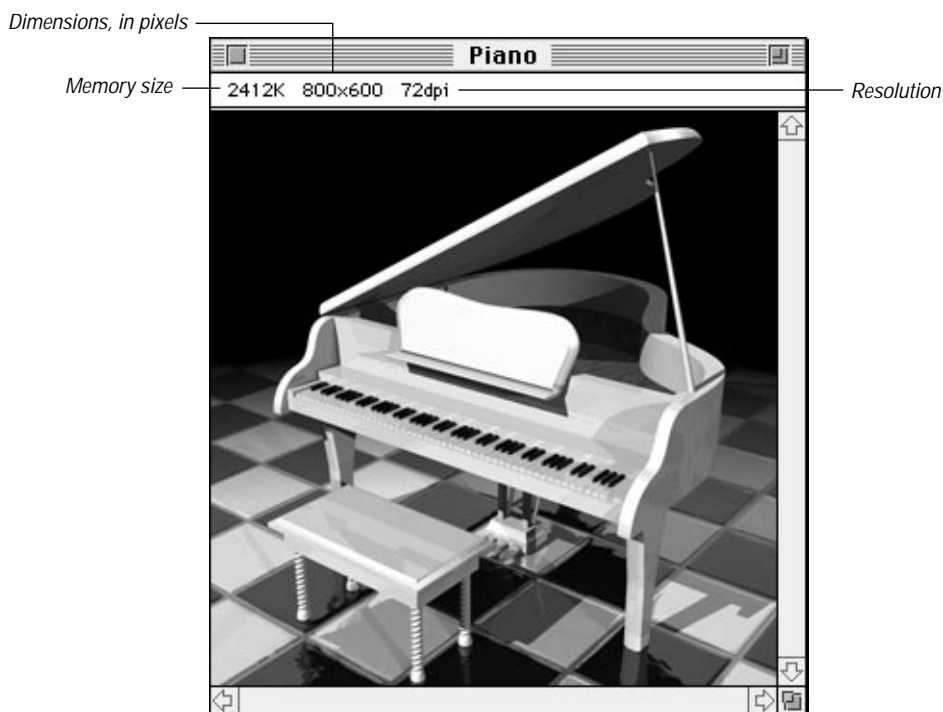
Image windows are used to display images on the screen. The image contained in the image window can be from any source, not just from images produced in StudioPro. These images can be in any format that is supported by the import/export extensions. PICT is the native Macintosh format and, therefore, requires no extension.

When you open an image in StudioPro, the feedback area above the image con-

tains information pertaining to the file's size, the memory required to store the image, and the dots-per-inch resolution.

You can have as many image windows open at a time as memory allows. Once opened, you can save an image in any format that is supported by StudioPro. You can also print the image to the printer selected in the Chooser.

Horn Movie

Plus menu

Play / Pause

Relative Jog slider

Go to first frame

Go to last frame

Resize box
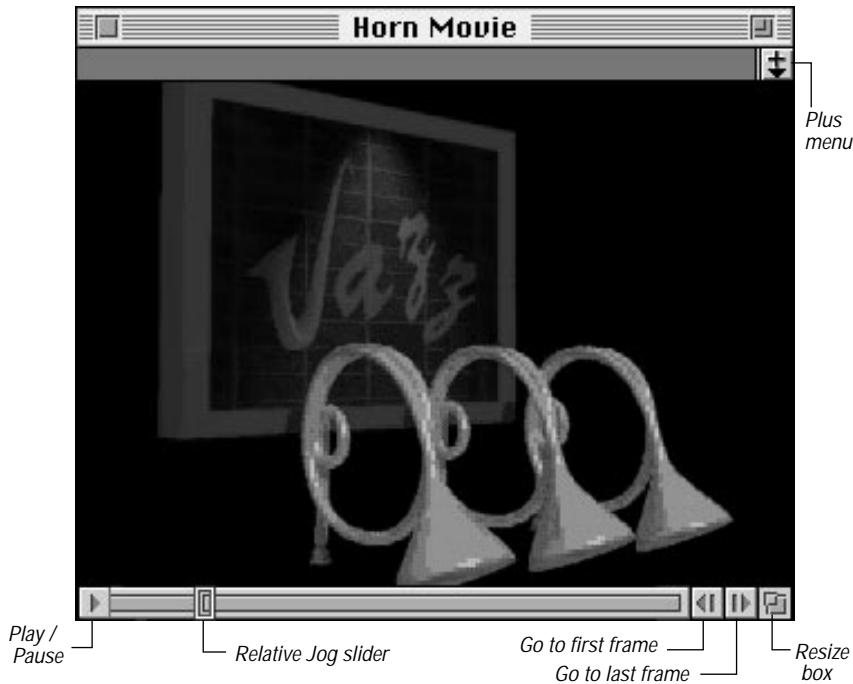
Animation windows are provided for playing back QuickTime movies once they've been rendered.

When you render a set of frames in an animation sequence using the QuickTime format, the files are automatically assembled and saved as the frames are rendered. You can specify the total number of frames to be rendered and the starting frame through the **RENDER** command in the Rendering menu.

In addition to the buttons found on the Animation window, StudioPro allows you to control animations by using the arrow keys and the Return key.

Return key	Start or Stop Playback (toggles each time pressed)
Left-arrow	Move backward one frame
Right-arrow	Move forward one frame

Plus Menu

The Plus menu contains commands that deal with playing back animations.
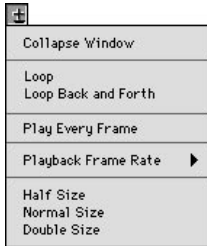
COLLAPSE WINDOW. This command collapses the Animation Playback Window to display only the title bar.

LOOP. This command toggles on and off each time you select it. This command causes the movie to repeat playing over and over again, each time from the beginning to the end, until you click the *Stop* button or until you select the command again to disable it. When **LOOP** is enabled, a check appears to the left of the command.

LOOP BACK AND FORTH. This command toggles on and off each time it is selected. When this command is selected, the animation first plays forward, then reverses and plays backwards. The cycle repeats until you click the *Stop* button or select the command again to disable it. When this command is enabled, a check appears to the left of the command.

PLAY EVERY FRAME. The option toggles on and off each time you select it. Select this command to enable or disable frame skipping in QuickTime Movies.

When this option is disabled, any sound channel(s) that may be part of a movie file are given priority. The sound is then played at the correct speed and the frames are played as they can to keep up, sometimes requiring a frame to be skipped occasionally to maintain the correct time sequence.

PLAYBACK FRAME RATE. This command allows you to set the speed at which to play your QuickTime movie.

When you open an QuickTime movie created in StudioPro, the *frames per second* rate set in the Project Window when it was rendered is automatically pre-selected in this sub-menu. You can use that setting, choose to use a different playback rate from the sub-menu, or set a custom frame rate through the *Other* option.

If you choose *Other* from the sub-menu, a dialog opens so that you can enter the frame rate you want to use for playback. Enter a value between one and 60.

The maximum speed at which the animation window can play an animation depends on the capacity of your hardware.

Your QuickTime movie file will be played back as fast as your hardware will allow. If you choose a play rate that is faster than the hardware's ability to respond, the animation will play as fast as possible, whatever that speed may be.

HALF SIZE. This command displays the frame size of the animation file at one half of its normal size.

NORMAL SIZE. This command displays the actual frame size. This is the default size used when playing an animation.

DOUBLE SIZE. This command displays the frame size of the animation at twice its actual size. Displaying the animation with this option enable requires additional memory.

3

REFERENCE
MATERIAL

The QuickTime extension provides several software compression methods that are listed in the pull-down menu of the *Compression Settings* dialog. Each compressor is designed for a specific type of use. Using a compressor not intended for your needs is not necessarily wrong, but using the right compressor can significantly improve playback performance.

The following explanations are provided for background:

VIDEO

Of all the available compressors, the *Video* compressor is best suited for capture and compression of analog video, high-quality playback from hard disk, and moderate to high quality playback direct from CD-ROM. This compressor can play back at frame rates of 10 fps or better, and can be transcoded to achieve further compression and to permit the ability to play back directly from CD-ROM. A file compressed with this method is re-compressible with minimal or no quality degradation, allowing digital effects processing and editing to be applied in repeated passes.

COMPACT VIDEO

This compressor is an extension of the *Video* compressor. All characteristics and uses identified for the *Video* compressor apply here as well, with one exception. It achieves a better image quality for a given compression level because it has been optimized for 16-bit color ONLY (thousands of colors). The dithering algorithm is significantly improved because of this optimization.

ANIMATION

The *Animation* compressor is best suited for images that are originally created in digital form, such as renderings. It performs best on images that have no noise. The *Animation* compressor can be used to compress digitized analog video, but it may not produce high compression ratios from that type of material. If the *Animation* compressor is used for captured analog video, it will produce very good picture quality which can be played from a hard disk. It is unlikely that this compressor will be fast enough to compress and/or play analog video sequences from CD-ROM at sufficient speed.

PHOTO

Of all the currently available compressors, the *Photo* compressor produces the highest quality images at the best compression ratios. It is better known as *JPEG* compression. However, it is not currently fast enough to play back moving image sequences with sound at acceptable frame rates. Because it does achieve such a good result at high compression ratios, the *Photo* compressor can be used effectively as an archival method for video clips with high disk space requirements. *JPEG* is supported on several platforms, making this compressor a viable interchange format

between computers of different manufacturers.

NONE

The *None* compressor is a very good format to use for acquisition of analog video. It is also good for digitally-generated animations. It has the advantages of having a very good image quality (since no compression is applied), it can capture in real-time with sound on higher-end machines, and it can be further transcoded off-line to produce movies with much better compression ratios. The disadvantage is the high disk space requirement.

GRAPHICS

The *Graphics* compressor is a good format for acquisition of analog video when there is a need to have very good picture quality for playback on eight-bit displays. To achieve the best results, it is necessary to capture the video at 24 bits per pixel, apply error diffusion dithering as it is converted to eight bits per pixel, then compress the result. Although the *Graphics* compressor was intended primarily for use with 8-bit source material, it can be effective for video in this context. It does not achieve high compression ratios for video, so it is not currently suitable for playback directly from CD-ROM. It will work well for play back from hard disks.

YUV

The *YUV* compressor is somewhat specialized. It is useful with certain video-editing solutions. It makes a good intermediate storage format if you are applying multiple effects or transitions to an animation. The compression ratio is always 2:1 and the image quality is extremely high. However, it does not support frame differencing.

The aspect ratio provides you with the width and height frame dimensions of an image.

Various video signal formats allow you to print digital data to a videotape. There are several different video signal formats that can be used. A videotape recorded using one format cannot be viewed on a videotape player or monitor of a different format.

Common Aspect Ratios

The following is a list of common aspect ratios:

- Small (160 x 120)
- Medium Small (180 x 135)
- Medium Large (240 x 180)
- Large (320 x 240)
- Classic (512 x 342)
- Powerbook (640 x 480)
- 13" Standard (640 x 480)

NTSC and PAL Formats

NTSC

NTSC stands for the National Television Standards Committee. It is a video signal standard used by the color television industry in the United States and Japan.

The NTSC is a common format used by many video compression boards.

NTSC video contains frames and fields. Most NTSC video frames consist of two interlaced fields. Each field is displayed as alternating horizontal lines across the screen. Most computer video formats are non-interlaced.

The frame aspect ratio used by the NTSC standard format is 4:3. This format uses a 640 by 480 resolution.

By using the NTSC standard for digital video, there are two areas of concern when dealing with aspect ratios. They are as follows:

- Pixel aspect ratio
- Frame aspect ratio

There are various divisions within the NTSC standard which determine what pixel and frame aspect ratios are used. These formats are as follows:

- NTSC (resolution 648 x 486 - preferred format)
- D-1 NTSC (resolution 720 x 486)
- D-1 NTSC Square Pix (resolution 720 x 540)

NTSC (Preferred Format)

This NTSC format uses a 648 by 486 resolution format. This format makes an allowance for a few additional pixels to be created on the screen edge that may be cut off when displayed. This format is also commonly used by many video compression boards.

Because this format allows you to display a video without losing the "edges" of your video during playback, this resolution

seems to be the preference within the industry.

D-1 NTSC

The D-1 NTSC format uses the same standard frame aspect ratio as the NTSC format. Unlike the NTSC format, the D-1 NTSC format uses a 720 by 486 resolution using rectangular pixels.

The D-1 pixels used in the NTSC format are displayed using a vertical axis.

D-1 NTSC Square Pix

This format uses the same standard frame aspect ratio as the NTSC format. Unlike the NTSC format, the D-1 NTSC Square Pix uses a 720 by 540 resolution using rectangular pixels.

PAL

PAL stands for the Phase Alternating Line. This is a video standard used by the color television industry and is the common standard used in Europe. This video signal format sets the video to playback at 25 frames per second which contain 625 lines of pixels in each frame.

There are various divisions within the PAL standard which determine what pixel and frame aspect ratios are used. These formats are as follows:

- PAL (resolution 720 x 486)
- D-1 PAL (resolution 720 x 576)

- D-1 PAL Square Pix (resolution 768 x 576)

D-1 PAL

The D-1 pixels used in the PAL format are displayed using a horizontal axis. This format uses the same standard frame aspect ratio as the PAL format. Unlike the PAL format, the D-1 PAL uses a 720 by 576 resolution.

D-1 PAL Square Pix

This format uses the same standard frame aspect ratio as the PAL format. Unlike the PAL format, the D-1 PAL Square Pix uses a 768 by 576 resolution using rectangular pixels.

HDTV (1280 x 720)

The HDTV stands for High Definition Television. This format is a proposed definition which displays at 1280 by 720 resolution.

HDTV (1920 x 1080)

The HDTV stands for High Definition Television. This format is a proposed definition which displays at 1920 by 1080 resolution.

Film (Academy)

This format uses 2048 x 1536, a standard resolution used for digital film.

The following information is provided as a guide for designing texture maps for real-world materials you may want to simulate in your models. Other factors in your model may require that you fine-tune some of these settings to produce the effect you want in the finished rendering. Still, the information in the following list will provide a good starting point from which you can build.

Note there are no *Micro-Polish* settings indicated in the following chart. These have been pre-set in the program. You should select the appropriate *Micro-Polish* setting from the dialog's pop-up menu when applicable to the texture.

	Ceramic	Paint	Paper	Plastic	Plexiglass	Rubber	Titanium	Chrome	Glass
Diffuse	60	50	100	100	20	70	0	80	20
Ambient	55	35	100	100	0	15	100	80	20
Glow	0	0	0	0	.33	0	0	0	0
Opacity	100	100	100	100	0	100	100	100	10
Refraction	1.00	1.00	1.00	1.00	1.20	1.00	1.00	1.00	1.50
Specular	95	33	5	90	100	5	100	100	80
Reflect	25	15	0	15	15	0	30	100	20

The following list of indexes of refraction was compiled and edited from the 63rd Edition of the Handbook of Chemistry and Physics published by CRC Press. This list is offered as a guide only in applying custom refractive indexes to textures which will be simulating these materials.

MINERALS

Amber 1.455	Hematite 3.220
Amethyst 1.544	Lazulite 1.604
Argonite 1.530	Leucite 1.508
Azurite 1.730	Magnetite 2.020
Bentonite 1.757	Moss Agate 1.540
Beryl 1.565	Onyx Marble 1.486
Borax 1.447	Opal 1.450
Brucite 1.560	Quartz 1.544
Calcite 1.658	Rose Quartz 1.550
Calomel .1.973	Rhodonite 1.711
Celestite .1.621	Ruby 1.766
Chlorite 1.570	Sapphire 1.770
Chromite 2.160	Serpentine 1.530
Diamond 2.418	Smoky Quartz 1.550
Dolomite 1.679	Spinel 1.719
Emerald .1.576	Sulfur 1.958
Erythrite .1.626	Talc 1.539
Fluorite 1.433	Topaz 1.606
Gypsum 1.519	Turquoise 1.610
Halite 1.544	YAG Rhodochrosite 1.830
Helvite 1.728	Zircon 1.923

INORGANIC COMPOUNDS

Air. 1.0003

Aluminum Chloride 2.700

Aluminum Oxide. 1.665

Barium Oxide 1.980

Calcium Borate. 1.540

Calcium Carbide 1.750

Calcium Sulfite 1.590

Copper Chloride 1.644

Common Glass. 1.600

(ranges from 1.5 to 1.9,
depending on composition)

Ice 1.305

Iron Sulfate 1.802

Lead Nitrate 1.782

Lithium Bromide 1.784

Lithium Chloride 1.662

Lithium Oxide 1.644

Manganese Borate 1.617

Manganese Chloride 1.555

Mercury Cyanide. 1.645

Mercury Iodide. 2.748

Potassium Cyanide 1.410

Potassium Fluoride 1.352

Sodium Bromide 1.479

Sodium Cyanide. 1.452

Sodium Nitrate. 1.587

Sodium Phosphate. 1.440

Strontium Fluoride 1.442

Strontium Oxide. 1.870

Tin Iodide 2.106

Water 1.333

Zinc Bromide 1.545

Zinc Silicate. 1.616

ORGANIC COMPOUNDS

Methanol 1.326

Ethyl Ether 1.352

Acetone. .1.357

Ethanol .1.359

Ethyl Acetate 1.370

Acetic Acid. 1.370

Proprionic Acid 1.385

Butyric Acid. 1.397

Sulfuric Acid 1.427

Ethelene Glycol. 1.434

Chloroform 1.444

Fluorobenzene 1.463

Toluene. .1.494

Benzene .1.498

Methyl Benzoate. 1.515

Benzyl Alcohol 1.538

REALISTIC GEMS

You should note that in order for polygonal objects in StudioPro to realistically render with the type of complex crystalline appearance of precious and semi-precious gems, they must contain an interior structure of transparent surfaces through which the light can interact and refract realistically. Additionally, you must pay special attention to the following points:

1. You must model the correct geometry for the gem(s) you wish to simulate. For example, does the gem have a Cubic, Tetragonal, Hexagonal, Trigonal, Orthorhombic, Monoclinic, or Tricliniccystalline shape?

2. You must create and apply a texture that uses a second smoothness value corresponding to the internal crystalline structure. (This is definitely one of those trial and error type of projects.)

3. You must increase the value in the transparency recursion field of the Raytracer Esoterica dialog box (opened through the Rendering Options command's dialog box) so that the multiple transparent surfaces will be fully noted and rendered by the raytracer.

GLOSSARY

Algorithm – a recursive mathematical procedure.

Alpha channel – an eight-bit channel in the 32-bit color image which is used to store transparency data.

Ambient light – light that is present in the environment. It has no focus or direction.

Anti-aliasing – a mechanism to prevent or remove the jagged appearance of diagonal lines or edges in an image. Anti-aliasing can be achieved in rendered images by averaging adjacent pixels with sharp variations in color and brightness or by increasing the resolution of the image to meet or exceed the resolution of the device displaying or printing it.

Bézier splines – lines that are curved or capable of being curved. The curve of the line is defined by vertex points.

Bitmap – also known as a pixel image. An image composed of pixels. May be any resolution or color depth. Rendered images may be saved as a bitmap file in either PICT or TIFF format. Surface maps are contained in textures as bitmaps.

Bounding Box – an imaginary rectangle that exactly encloses the geometry of an object or group of objects. When an object is selected, handles appear at the corners and midpoints of the sides of this rectangle. When an object is manipulated using one of the object-handling tools, its bounding box appears to interact with the tool and provide visual feedback during the tool operation.

CAD – an acronym that stands for Computer-Aided Design.

Click – the act of positioning a tool cursor in a view, and usually on an object, then pressing the mouse button. This event initiates a process or operation related to the tool's function.

Click-and-Drag – the process of clicking the mouse button and, while holding the mouse button down, dragging the cursor in the view. For example, this procedure would be used to move an object from one location to another in a view.

Color Depth – the number of bits required to define the color of each pixel in an image. Black and white images use one bit. Grayscale images use eight bits (256 shades of gray). Eight-bit color images provide 256 colors. Images with 24-bits provides millions of colors (eight bits for each color: red, green, blue). Images with 32 bits provide an additional eight bits for alpha data.

Cursor – an icon indicating the current tool selected and/or the current focus of the program. StudioPro uses different cursors to indicate the selected tool.

Database – the area of memory within the program while it is running that is set aside to keep track of objects within a model.

Default – a parameter or setting pre-defined in the program which may be changed by the user.

Diffuse Reflection – that component of the light reflecting from a surface caused by its dull or matte nature. Dull or matte surfaces reflect the light striking them in random angles over a large area, giving the surface an equally-bright appearance from a wide range of viewing positions.

Dither – to blend transitions between colors by placing small dots of black, white, or other colors to simulate those colors that can't be represented because of limits on the numbers of colors available.

Double-click – the act of positioning the cursor on an object in the active view or an icon in the interface, then pressing and releasing the mouse button twice in rapid succession.

dpi – an abbreviation for dots per inch.

EPS – short for encapsulated PostScript™, a file format for graphics. EPS format contains all of the code necessary to print a file.

Extension – a modular software program that expands the capabilities of the existing software. The extension functions as if it were part of the original program.

Extrusion – a method of creating a 3-D object using a 2-D template; giving depth to the 2-D shape.

File compression – the process of reducing the amount of storage space used by a file.

Filter – a routine for altering images.

Flat Shading – shading by filling each facet of a surface with a single color.

Gradient – a feature that adds color or tint that varies smoothly from one color or brightness to another.

Group – a collection of objects that act as one.

Hierarchical Object – creating an object shape in a separate work space which, when inserted into the model, retains a link to the shape. Changes made to the shape are automatically applied to the instances.

Hue – the property of color which corresponds to the frequency or wavelength of the light.

Instance – a replica of a shape. Each time a shape is inserted into a window, an instance of that shape is actually inserted. Any changes made later to the original shape are reflected in each instance, or occurrence, of the shape. Changes made to the instance, however, do not in any way affect the root shape.

Jaggies – refers to the jagged edges formed in the diagonal or circular lines of bit-mapped images.

JPEG – short for Joint Photographic Experts Group, a committee that has been developing a compression standard for still images. This term also refers to the compression method developed by that group.

Lathing – a method of creating a 3-D object by revolving a 2-D profile about a designated axis.

Luminance – the amount of light radiated by a monitor. It refers to intensity or brightness.

Marquee – a rectangular dotted box created by dragging the cursor. Marquees appear in the programs windows or views to provide visual feedback during various tool operations.

Mesh Surface – a surface that has common vertex points between adjacent polygons. Mesh surfaces are typically used to define complex forms. The surface also provides smoothing information for the rendering algorithms.

Normals – the mathematical value that indicates the direction a surface is facing in 3-D space. Normals may be attached to individual polygons or to the vertex points that define the polygons.

Octree – an internal data structure used to subdivide the model space for more efficient handling.

Orthographic – a method of displaying objects in a view where parallel lines do not converge. Orthographic projections are used to compare object's absolute dimensions, without the confusion of relative distance from the view.

Parent/Child Link – an internal connection between two objects, in which the child is linked to the parent for constraint purposes. Various uses exist in different applications for linked objects, but are usually related to animation.

Perspective – a depth cue available in StudioPro in which parallel lines converge to align with a designated vanishing point.

Perspective is a product of several parameters in the displayed view: Lens focal length, camera size, and distance from objects.

Penumbra – A partial shadow between regions of total shadow and total illumination.

PICT – the standard file format used by Macintosh for storing graphics using Apple's QuickDraw imaging routines.

Pixel – an acronym that stands for Picture Element. It is the smallest component which makes up the display on a computer monitor. Each dot on the screen is a pixel. Many images displayed on the screen are likewise stored in a pixel form that is mapped to the screen pixels for viewing.

PointCloud – a rendering method used primarily for displaying the model in the modeling window. Only the vertices are rendered.

Point light – a local source of illumination that shines in all directions from a single point.

Polygon – a closed plane bounded by three or more line segments.

Primitives – basic geometric elements from which complex objects can be built.

Radiosity – the process of determining how light is transferred between surfaces based on their color and proximity. Radiosity is capable of producing remarkable realism.

Raytracing – a rendering algorithm which simulates the physical and optical proper-

ties of light rays as they reflect off objects in a 3-D model. This method of rendering typically traces rays of light backward from the imaging plane toward the light sources.

Reflectivity – the percentage of the total amount of light striking the surface that reflects from, or bounces off, the surface of the object.

Refraction – the change in direction of light as it passes from one transparent material to another. This causes an apparent shift in the image showing through the transparent material.

Rendering – a visual representation of the model. This is accomplished by combining a geometric model with descriptions of its surface properties, lighting, etc. to generate a photorealistic image of the model.

RGB – a method of representing all colors as the combination of red, green, and blue light.

Saturation – the extent to which a color is made purely or a particular hue; the vividness of the hue.

Specular Reflection – that component of the light reflecting from a surface caused by its shiny or glossy nature. Shiny surfaces reflect light striking them in clearly defined angles of incidence; resulting in "hot spots" corresponding to the direction of the light sources providing the illumination.

Surface Mapping – a process in which an image is used to define an object's surface properties. A separate map is used to define color, texture, reflectivity, transparency.

Spotlight – a local source of illumination which shines in only one direction

Sweep – a method of creating a 3-D object from a 2-D template using a combination of lathe and extrude. The template is both pushed through space and revolved around an axis at the same time to create a geometrically complex shape. This type of modeling would be used to create the threads on a bolt, for example.

TIFF – short for *Tagged-Image File Format*. This format was developed by Aldus® and Microsoft® to represent pixel-based images, such as those produced by scanners.

Tile – to fill an area with small, regular shapes or blocks of patterns.

Transparency – the characteristic of allowing an underlying image to show through, either partially or totally.

Vertex – a point of intersection of two vectors or a point used to define a polygon.

Virtual memory – a portion of a hard disk that is available for working files to supplement a computer's RAM.

Volumetric Mapping – a process in which a map is defined as a 3-D volume, but which is only visible on the surface of an object. The object has the appearance of being carved out of the volume. Volumetric maps may also be used to define multiple surface characteristics.

Window – an element of a Macintosh desktop interface that contains one or more views of the 3-D model. There are several types of windows used in StudioPro.

Wireframe – a fundamental rendering method that represents 3-D objects with connecting lines. No surfaces are shown, but may be implied if hidden lines are removed for the resulting image.

X-axis – the horizontal axis which represents width.

Y-axis – the vertical axis which represents height.

Z-axis – the axis which represents depth.

INDEX